

FLIGHT

The
AIRCRAFT
ENGINEER
&
AIRSHIPS

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

No. 611 (No. 37, Vol. XII.)

SEPTEMBER 9, 1920

Weekly, Price 6d.
Post free, 7d.

Flight

The Aircraft Engineer and Airships

Editorial Offices: 36, GREAT QUEEN STREET, KINGSWAY, W.C. 2

Telegrams: Truditur, Westcent, London. Telephone: Gerrard 1828

Annual Subscription Rates, Post Free:

United Kingdom .. 30s. 4d. Abroad.. .. 33s. 6d.*

These rates are subject to any alteration found necessary under abnormal conditions and to increases in postage rates

* European subscriptions must be remitted in British currency

CONTENTS

| | PAGE |
|---|------|
| Editorial Comment | |
| A Coming Air Congress | 967 |
| Petrol Prices and Aviation | 968 |
| Open Enquiry into Accidents | 968 |
| Weather Charts by Wireless | 970 |
| The Air Ministry Competition | 970 |
| Air Ministry Trials | 971 |
| The Air Ministry Seaplane (Amphibian) Competition | 972 |
| The Royal Aero Club Official Notices | 976 |
| Air Ministry Notices | 977 |
| The Glenn-Martin Navy Torpedo Plane | 979 |
| Aeronautical Camouflage | 981 |
| Airships from the Four Winds | 984 |
| The Royal Air Force | 985 |
| Spray Painting | 986 |
| Models | 987 |
| Sidewinds | 988 |

DIARY OF FORTHCOMING EVENTS.

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

| | |
|-------------------|--|
| Sept. ... | Air Ministry Amphibian Competition, Felixstowe and Martlesham |
| Sept. 8, 9 and 10 | Fédération Aéronautique Internationale Conference, Geneva |
| Sept. 18-19 | Schneider International Race, Venice |
| Sept. 28 ... | Gordon-Bennett Aviation Cup, France |
| Oct. 1, 2, 3. | A.C.F. Meeting at Buc |
| Oct. 7 ... | Lecture on "Civil Aviation," by Sir F. H. Sykes |
| Oct. 21 ... | Lecture, "A Comparison of the Flying Qualities of Single and Twin-Engined Aeroplanes," by Squadron-Leader R. H. Hill |
| Oct. 23 ... | Gordon-Bennett Balloon Race, Indianapolis, U.S.A. |
| Oct. or Nov. | U.S. National Aeroplane Race (New York to San Francisco) |
| Nov. 1 ... | First Open Competition for R.A.F. Boy Mechanics |

EDITORIAL COMMENT



It is understood that the Air Ministry is preparing the arrangements for a great Air Congress, to be held in London, the main object of which is to familiarise the business community with the potentialities of aviation for commercial purposes. Mr. Winston Churchill, the Secretary for Air, is taking the greatest interest in the scheme, and will probably open the Congress. The latter will occupy three days, and aviation in all its aspects will be discussed—civil, military and technical.

We are exceedingly glad to hear this, for undoubtedly aviation requires a fillip to help it along. It is established as a means of transport, but the public at large, and even the business community, does not as yet realise what has been done, or how far it has travelled on the road to certainty and efficiency of working. We have many times insisted that what is wanted more than anything else is the right kind of propaganda in order that all the possibilities should be brought home as graphically as possible to those upon whom air transport must depend for its ultimate success. Such a Congress as that to be organised will go a very long way towards the goal, provided the necessary publicity for its proceedings is obtained. We sincerely trust, therefore, that the Congress will not be of the hole-and-corner description, and that nothing will be left undone to interest the Press of the country in its proceedings. Too often, with the best of intentions no doubt, these Government organised affairs fail of their object in consequence of the inevitable official liking for secrecy and the general spirit of aloofness which characterises the attitude of the departmental mind towards the general public. In justice to the Air Ministry, however, it must be said that there is a good deal less of this than is the case with most other departments. It is mostly staffed by comparatively young men who have not been brought up in the hide-bound traditions of the Civil Service and there is an atmosphere about it which indicates

a sincere desire to do the best possible for aviation in all its branches. Moreover, the Air Minister himself is no mean judge of the value of publicity. We look forward, therefore, to a large measure of success in connection with the Congress.

Petrol Prices and Aviation

As we said must undoubtedly be the case, the recent increase in the price of petrol has proved to be a very severe blow to aviation. It has fallen at a time when aviation is just beginning to emerge from the pioneer stage, and is being carried on under conditions which are not, and have not been, at all favourable to its development. If we take the case of the services operating from London, we find that they have been conducted on a very small margin of profit, yet if they are to keep going they cannot increase their charges for passengers or freight except as a very last resource and when they are absolutely compelled to do so. What the new prices mean to aviation companies is shown by figures given by Messrs. Handley Page in connection with the London-Paris service. The increase of 7d. per gallon, quite unjustifiably added by the petrol companies, means an addition of over £8 to the cost of the return journey. Other companies suffer in proportion, and it is difficult to see how their enterprises are to be carried on without an increase in charges. The latter have been made as low as possible in order to tempt travellers to take advantage of the facilities offered by aerial transport, and just as the public were getting used to it the petrol companies have chosen to throw this latest bomb into the camp. Unfortunately, the industry is helpless in the hands of the Trusts. We do not and cannot for years to come produce even a moiety of the fuel we require to keep our transport services in being, and must, as a consequence, continue to be dependent upon overseas supplies, which are controlled at their source by aliens who care for nothing but their own pockets.

It is of little avail to talk about alcohol as a substitute for petrol. The plain truth is that we cannot produce it commercially at all, and when overseas supplies are developed we shall be very much in the same case as we are to-day in relation to petrol—dependent upon the grace of those who control the sources of supply. So far as we are able to see, our only hope in the meanwhile is to accept the suggestion of our sister journal, the *AUTO*, and promote immediate legislation for the compulsory carbonisation of every ton of coal brought up in order that the volatiles may be recovered instead of being dissipated into the atmosphere through a million chimneys. If that were done, we could produce the greater proportion of the fuel we need, so long as the coal measures last, and by the time these are exhausted it is quite possible—even probable—that science will have discovered some new source of power which will render us completely independent of all outside supplies of fuel for power-raising.

Open Enquiry into Accidents

In a leading article *The Times* recently formulated the suggestion that the time has come when machinery should be created for carrying out proper enquiries into the cause of accidents to aircraft and for the publication of reports thereon. We agree generally with the view, though we cannot say we are exactly in accord with *The Times'* sugges-

tion for giving force to it. This suggestion is that the work should be done by the Ministry of Transport. "We should be reluctant," says *The Times*, "to provide a pretext for the creation of a new Government Department, with a new army of officials; but there is no need for this. The Inspectors of Railway Accidents, now passed from the Board of Trade to the Ministry of Transport, have full experience of the kind of enquiry that is useful, and the machinery for making it exists. At the most, a single new assistant with some knowledge of motors and aeroplanes is all that is required. His business will not be to suggest improvements in construction, but to observe, classify and report."

In so far as the question of enquiry into accidents is concerned, *The Times* does not appear to know that much better machinery already exists than it advocates, in the Accidents Investigation Committee of the Royal Aero Club, to say nothing of the expert knowledge available at the Air Ministry, which has an Accidents Investigation Branch. Nothing that seems desirable to *The Times* is lacking but the statutory power to make public reports. The Air Navigation Bill, which should pass through both Houses before the end of the session, can easily, if it be thought desirable, be amended by the addition of a simple clause giving the same statutory authority to publish reports on accidents as was given to the Board of Trade by the Regulation of Railways Act, 1871. It should be said that *The Times*, in the article under discussion, included in a common category accidents to both road and air transport. As to the former, we have a perfectly open mind in the matter. If it should be generally agreed that every accident on the highways should be made the subject of enquiry, then the Ministry of Transport is the proper authority to conduct such enquiries. It may be remarked in passing that if this is the idea, the "single new assistant with some knowledge of motors" is likely to be a very busy person indeed. So far as aerial accidents are concerned we entirely disagree with the idea that the inspectors of railway accidents, even with the assistance of the new single assistant aforesaid, should have anything to do with enquiries. They are experts in railway matters, and may have a very sound knowledge of road transport vehicles and conditions, but they are very far from being experts in aeroplane or airship construction or navigation. We have not yet arrived at the stage of development in aerial navigation when the unquestionably valuable quality of the judicial mind and the ability to weigh up witnesses is all that is necessary to arrive at proper conclusions regarding accidents. Something much more is required, which can only be supplied by a close and really expert knowledge of aircraft construction and flying conditions. That, we submit, is only possessed by those who are already charged with enquiry into accidents to aircraft. Moreover, we are most absolutely opposed to the idea of the Ministry of Transport having anything to do, directly or indirectly, with aviation. To bring the new transport under its blighting influence, in any shape or form, would be the last straw. It has made a mess of everything that has come within its scope, and nobody has the smallest faith in its capacity to do anything but collect statistics. It is not as though aviation had no department of its own. The Air Ministry exists to, among other duties, administer the laws and regulations under which aerial navigation is



THE PYRAMIDS : A bird's-eye view from the air

carried on, and it has shown itself perfectly competent to do so. That being so, we are rather at a loss to discern the idea underlying the suggestion that another department of proved incapacity should be entrusted with what is obviously a part of those duties.

Weather Charts by Wireless

A Notice to Airmen, which we publish in full this week, is of peculiar interest, in that it not only demonstrates the exceedingly active measures which are being taken by the Air Ministry to assist aerial navigation, but because of the progress it denotes in wireless science as applied to commercial purposes. It notifies that thrice daily, at 3.15 a.m., 8.45 a.m., and 8.15 p.m., all the data for preparing a complete synoptic weather chart will be issued by wireless telegraphy on a 1,400-metre continuous wave from London, and four times daily on a 3,300-metre wave from Aberdeen. This means that the pilot whose machine is equipped with wireless will be kept informed of the weather conditions prevailing over the whole of the British Isles. In addition, if he has a working knowledge of the method of constructing weather charts from the data communicated, he will be able to plot the whole thing on an outline map of the British Isles, and be thus able to formulate an accurate forecast of the weather conditions he is likely to encounter on a long cross-country flight.

When the Air Ministry took over the meteorological service of the country we agreed that it was the best course that could have been adopted, but we could hardly have been expected to know that such immense progress would have been made in the comparatively short time that has elapsed. To say that the efficiency of the service has exceeded all expectations is to understate the case. The Ministry has done splendidly in the work of developing the service and making it of use to the aerial navigator, and not the least notable achievement is the one under present discussion.

The Air Ministry Competition

The Air Ministry Competitions for land machines have now come to a close, and although the awards of the judges have not yet been announced, the preliminary report on performances, which has just been issued, gives a very good idea of the results obtained, and apart from the points gained or lost on such questions as fire prevention, view, safety, ease of exit, etc., it should not be a difficult matter to forecast the winners. So far as can be seen from the table of results published elsewhere in this issue, the Handley Page "W.8" will receive first prize in the large class, and the Westland Limousine has done so well as to be almost a certain first in the small class. Whether or not the full amount of the prizes will be awarded is not possible to say, but the performance of these two machines

is, we think, such that they merit the full amount.

As regards the results obtained, nothing of a startling character has been brought to light, it is true; performance is now well known to be a matter of loading per h.p. chiefly, but nevertheless one point stands out clearly—the best figures for the

value of $\frac{W}{G}$ were obtained by machines having a low power-loading. This would appear to indicate that not only for performance but also for economy a low power-loading is an advantage. Thus the load/h.p. of the Handley Page "W.8" was 12.4 lbs. and for the Westland 11.61 lbs., and the economy figures were 9.2 and 8.6 respectively.

The lesson to be deducted from this fact would appear to be that for commercial work the most economical results will be obtained when engines of considerably larger power than is absolutely necessary are fitted, and are run normally at considerably less than full power. Although this would probably mean an engine or engines being fairly heavy per h.p., when this is counted on the basis of the power developed when throttled down to cruising speed, it would appear to give the best overall results, and it would at any rate provide ample reserve power for emergencies, and also greatly lengthen the life of an engine by running it all out on rare occasions only, such as in taking off and when meeting strong head winds.

An examination of the accompanying table also indicates that for economy in running the large machine is better placed than is the smaller. Thus the Handley Page "W.8" and Westland Limousine are both the largest machines in their class, and show the best economy figure. This is, perhaps, not surprising, and was foreshadowed by Mr. Handley Page several years ago, when he pointed out that in a large machine the material can be more economically employed by using built-up components where one is obliged to use solid components in a small machine. In commercial work, however, things are not always in favour of the large machines, and constructors of smaller craft may take heart from this. If a complete load can be guaranteed every journey the large machine scores, but as this is far from being the case the smaller machines are called into use as being more economical than a large machine flying with half-load. Also a feature which tends to make the comparison of the large and the small machine difficult is that in the competition the range called for is the same, whereas it is well known that the longer the range the better placed is the large machine. Thus the selection of a suitable machine will depend on a number of things, and no direct deduction from the Air Ministry Competition can be made to cover all cases. This should be borne in mind when looking at the performances and results of the Martlesham tests. Until the judges' awards are announced we will refrain from further comment.

Lieuts. Parer and McIntosh Arrive

ALTHOUGH they did not manage to get to Melbourne on their old machine, Lieuts. Parer and McIntosh arrived at Melbourne by air on August 31, landing on the Flemington Racecourse, and their travel-stained De H. machine, with Siddeley-Puma engine, was taken down from Culcairn and exhibited on the course.

Lieuts. Parer and McIntosh were officially welcomed by Mr. Hughes, to whom they handed the bottle of whisky which

they had brought from London. Special care had been taken throughout the trip to keep the bottle intact. When the storm of cheers subsided Mr. Hughes, thanking the two officers, declared that they had completed an Odyssey that would live in the annals of Australia. It had been an adventure without equal in the history of man. Lieuts. Parer and McIntosh had motored from Culcairn to Albury railway junction, where they took the new aeroplane and flew back to Culcairn so that the trip should not be broken.

AIR MINISTRY COMPETITIONS, 1920

TABLE OF DATA REGARDING THE LARGE AND SMALL AEROPLANES, ARRANGED ALPHABETICALLY IN EACH CLASS

| Name | Horse power | | Area sq. ft. | Weight in lbs. | | | | | | | | Fuel used in 7 hours cruising | | W G | Speed in m.p.h. | | | | "Get off," feet above ground | Landing, yards from mark | Lbs. per h.p. | | | | Lbs. per sq. ft. | |
|-------------------------------|-----------------------------------|--------------------|-----------------|------------------------------|-----------|----------------------|---------------------|--------------------------------------|---------------------|-----------------------|----------------------|-------------------------------------|--------------|------------|-----------------|-----|----------------------|---------------------|---------------------------------|-----------------------------|----------------------|---------------------|----------------------|---------------------|---------------------|-------------|
| | Nominal and type of engine | Actual | | Total | | | | | | Useful load | | Petrol and oil | Cruising | | High | Low | Total | | | | Useful load | | Performance tests | Reliability test | | |
| | | | | Empty (in- cluding water) | With fuel | Performance tests | Reliability test | Certificate of air- worthiness | Performanc. test | Reliability test | Indicated | | Actual | | | | Performance tests | Reliability test | | | Performance tests | Reliability test | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | Total | Useful load |
| (a) | (b) | (b) | (b) | (c) | (f) | (f) | (f) | (f) | (f) | (f) | (f) | (f) | (f) | (f) | (f) | (f) | (f) | | | | | | | | | |
| Large Aeroplanes | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Central Aircraft "Centaur" | 2-160 Beardmore | 354 at r.p.m. | 1,250 | 895 | 4,996 | 5,840 | 7,250 | 7,250 | 7,250 | 1,210 (d) | 1,210 (d) | 148.5 159.5 | 11 (d) | 7.6 (d) | 61 | 63 | 89 | 48 | 0 | 281 | 20.48 | 20.48 | 3.42 (d) | 3.42 (d) | 8.10 | 8.10 |
| Handley Page, "W.8" | 2-450 Napier "Lion" | 1,008 at r.p.m. | 2,200 | 1,456 | 7,850 | 9,843 | 11,443 | 12,500 | 12,500 | 1,400 1,618 (e) | 2,675 (e) | 279 288 | 9 | 9.2 | 84 | 88 | 119 | 55 | 74 | 263 | 11.35 | 12.40 | 1.60 (f) | 2.65 (f) | 7.86 | 8.58 |
| "Vickers-Vimy- Commercial" | 2-350 Rolls-Royce "Eagle" | 704 at r.p.m. | 1,800 | 1,335 | 7,790 | 9,257 | 11,057 | 12,500 | 1,600 | 1,600 2,860 (f) | 240 252.75 (f) | 12.75 294 (f) | | 6.3 (f) | 80 | 84 | 103 | 50 | 26 | 308 | 15.71 | 15.71 (f) | 2.27 (f) | 2.27 (f) | 8.28 | 8.28 (f) |
| Small Aeroplanes | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Austin "Kestrel" | 160 Beardmore | 177 at r.p.m. | 1,250 | 417 | 1,966 | 2,321 | 2,721 | 2,740 | 2,740 | 200 181 (g) | 219 200 (g) | 63.55 67.275 | 3.725 (g) | 3.0 (g) | 81 | 83 | 110 | 45 | 14 | 244 | 15.37 | 15.48 | 1.02 (h) | 1.13 (h) | 6.52 | 6.57 |
| Avro Triplane ... | 230 Siddeley "Puma" | 245 at r.p.m. | 1,400 | 498 | 2,460 | 3,064 | 3,683 | 3,683 | 3,666 | 419 402 (h) | 419 402 (h) | 105 109.5 | 4.5 (i) | 3.7 (i) | 79 | 83 | 96 | 51 | 1 | 239 | 15.03 | 14.96 | 1.62 (j) | 1.55 (j) | 7.39 | 7.36 |
| Bristol ... | 230 Siddeley "Puma" | 245 at r.p.m. | 1,400 | 566 | 2,654 | 3,190 | 3,590 | 3,591 | 3,590 | 200 397 (i) | 200 380 (i) | 85 90.18 88.58(h) | 5.18 (k) | 2.2 (k) | 82 | 86 | 108 | 49 | 19 | 314 | 14.65 | 14.65 | .82 (l) | .82 (l) | 6.34 | 6.34 |
| Sopwith "Antelope" | 200 Wolseley His- pano "Viper" | 210 at r.p.m. | 2,000 | 531 | 2,387 | 2,817 | 3,217 | 3,350 | 3,350 | 200 333 (l) | 333 433 (l) | 70.5 77.625 83.75(l) | 7.125 (l) | 4.3 (l) | 80 | 84 | 110 | 43 | 23 | 188 | 15.32 | 15.95 (l) | .95 (l) | 1.59 (l) | 6.06 (l) | 6.31 (l) |
| Westland "Six- Seater" | 450 Napier "Lion" | 504 at r.p.m. | 2,200 | 726 | 3,823 | 4,559 | 5,559 | 5,852 | 5,850 | 800 840 (m) | 1,133 (m) | 128 131 | 3 (h) | 8.6 (h) | 86 | 90 | 118 | 46 | 23 | 235 | 11.03 | 11.61 | 1.67 (n) | 2.24 (n) | 7.66 | 8.06 |

Explanatory Notes

The reference letters shown on the table refer to the figures directly above them:—(a) Weight of useful load carried on reliability trial divided by the gallons of fuel consumed—given to the nearest figure in the first place of decimals. The useful load is obtained by deducting from the total weight of the machine, as on the test, its weight with fuel for 450 miles at 80 m.p.h. but without load, and a weight of 200 lbs. to represent the pilot and his gear. (b) Shown to the nearest mile. (c) Shown to the nearest foot. (d) This machine carried only enough fuel for 315 miles at 63 m.p.h. These figures are not therefore comparable with the similar figures for the other machines. (e) Includes an allowance of 218 lbs. for excess fuel carried. (f) These figures show the estimated results if the machine had been loaded up to the full certificate weight for the reliability trial. (g) Includes a deduction of 19 lbs. for short fuel carried. (h) Corrected to certificate of airworthiness weight. (i) Includes a deduction of 22 lbs. for short fuel carried. (k) Actual duration of reliability test was 7 hours 5 minutes. These figures are corrected to 7 hours. (l) These figures show the estimate results if the machine had been loaded up to the full certificate weight, which was increased by 100 lbs. after the reliability test had been carried out. (m) Includes an allowance of 40 lbs. for excess fuel carried.



THE AIR MINISTRY SEAPLANE (AMPHIBIAN) COMPETITION

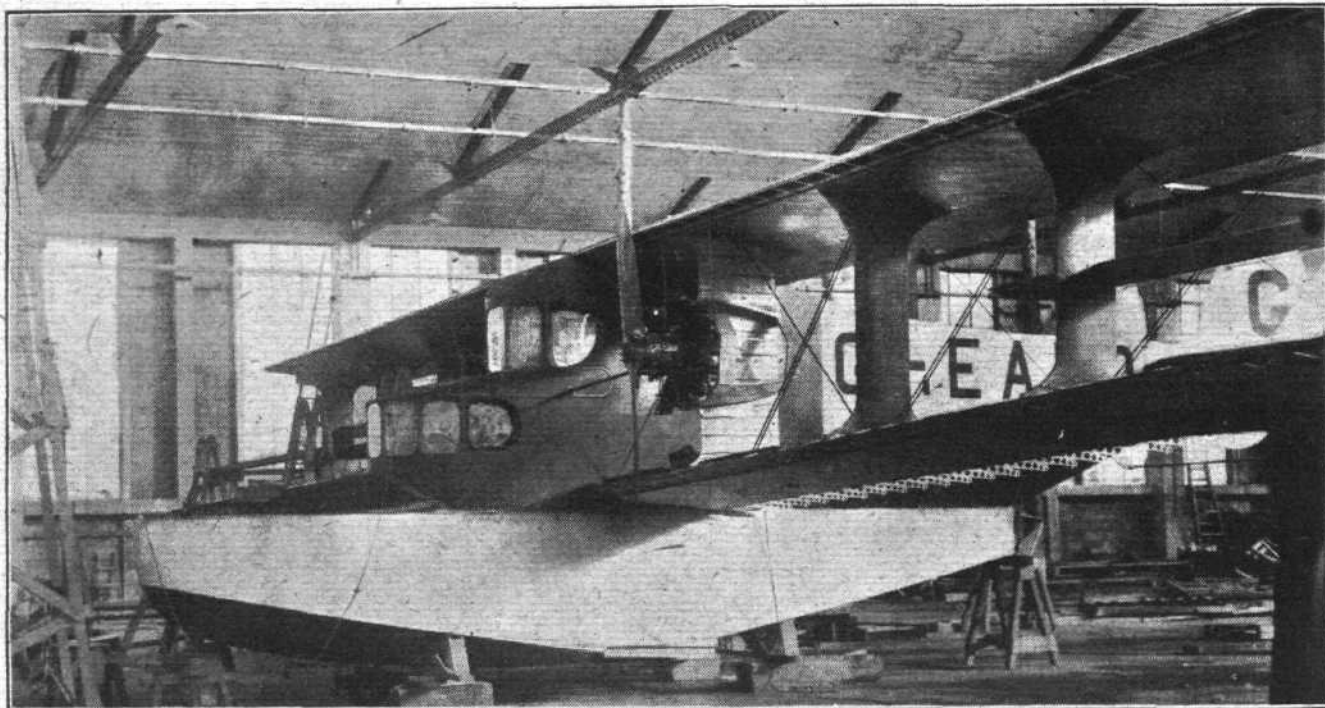
The Saunders "Kittiwake"

Delay in Starting

OWING to delay in finishing some of the machines entered for the amphibian part of the Air Ministry Competitions, it has not, at the moment of writing, been possible to commence the tests which are to take place at Martlesham Heath aerodrome and at Felixstowe seaplane station. It is hoped, however, that the machines will all have arrived at Martlesham by the end of this week, and it will then be a question of weather conditions whether or not the trials can be commenced. We understand that at present

have a considerably better performance than that indicated in our last issue; how much better will probably be brought out during the trials.

With regard to the machines entered, it now appears doubtful that the Beardmore "W.B. IX" will be finished in time to take part in the competition. This will reduce the number to four machines: the Fairey seaplane, the Saunders "Kittiwake," of which a description is published this week, the Supermarine flying-boat, and the Vickers "Viking." Of the Fairey and Supermarine machines no



"Flight" Copyright

THE SAUNDERS "KITTIWAKE": Three-quarter front view.

the only machine which is actually ready to start is the Vickers "Viking," which was at Martlesham punctually at the time specified. In connection with this machine we should like to point out an error in the description published last week. Owing to a misunderstanding it was stated that the "Viking" is fitted with a Rolls-Royce engine. This is incorrect, the engine fitted being a 450 h.p. Napier "Lion." With the extra power thus provided the machine should

information is available yet, but the accompanying description and illustrations of the Saunders "Kittiwake" should prove of interest, owing to the very unorthodox design of this machine.

The Saunders "Kittiwake"

In examining the Saunders "Kittiwake" amphibian flying boat designed for the Air Ministry Competition, one is at a loss to decide which one admires most—the originality



"Flight" Copyright

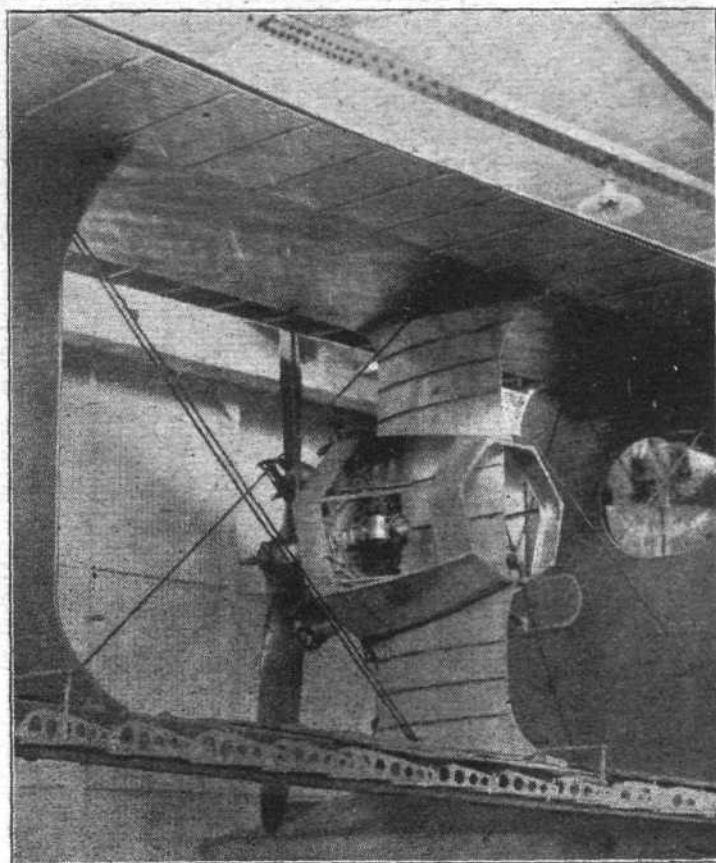
THE SAUNDERS "KITTIWAKE": Three-quarter rear view

of the general lay-out, the excellence of the detail work, or the courage of Mr. Saunders in sanctioning the building of a machine which is such a radical departure from orthodox practice. In almost every respect the "Kittiwake" differs from what one has become accustomed to regard as standard practice. This applies not only to the general arrangement, but equally to the majority of constructional details. And when a closer inspection is made it is at once realised that the originality of the design is not due to a desire on the part of the designer to produce "something different from everybody else's," but is the result of a serious attempt to meet the requirements of commercial aviation. Thus the passengers have been placed where they may be assumed to be as safe as possible in an aircraft—well above the water line and well aft of the nose, without any engines or other heavy weights behind and above them. The view obtained is excellent, and the cabin is roomy with plenty of head room.

The question of fire has been carefully considered, and in order to reduce to a minimum any possibility of the cabin catching fire in case of a crash, the tanks have been placed on the top plane, above their respective engines. This not only gets all petrol away from the hull and cabin, but means in addition direct gravity feed to the carburettors from the main tanks, reducing the length of piping to a minimum and doing away with all petrol systems as the term is usually understood.

The Cabins

The general arrangement drawings of the "Kittiwake" published herewith will give a good idea of the lay-out and proportions of the machine. Fundamentally, it will be seen the machine is a flying-boat, with a superstructure added which forms the passengers' cabin. This cabin is reached through doors in the side in line with the trailing edge of the bottom plane. For use on the sea short steps are provided on the sides of the boat, so that a small boat will simply run up just behind the trailing edge of the lower plane and the passengers enter by way of the steps and doors. Being aft of the planes the passengers are well away from the airscrews, so that even with the engines running the machine may be boarded without danger to the passengers. Inside the cabin seats are arranged in the form of "settees" along the sides, and six passengers can be very comfortably seated, while it is possible to get in seven without undue crowding. Should it be decided to provide parachutes as a standard equipment of passenger machines, these could be stowed in lockers along the sides of the aft portion of the fuselage, and as the doors in the cabin are just above the trailing edge of the lower plane, the passengers could easily jump clear. From the passengers' cabin steps lead down into the pilot's cabin in front, which is on a slightly lower level so as to provide a forward view for the passengers. The pilot sits on the starboard side and controls the machine by means

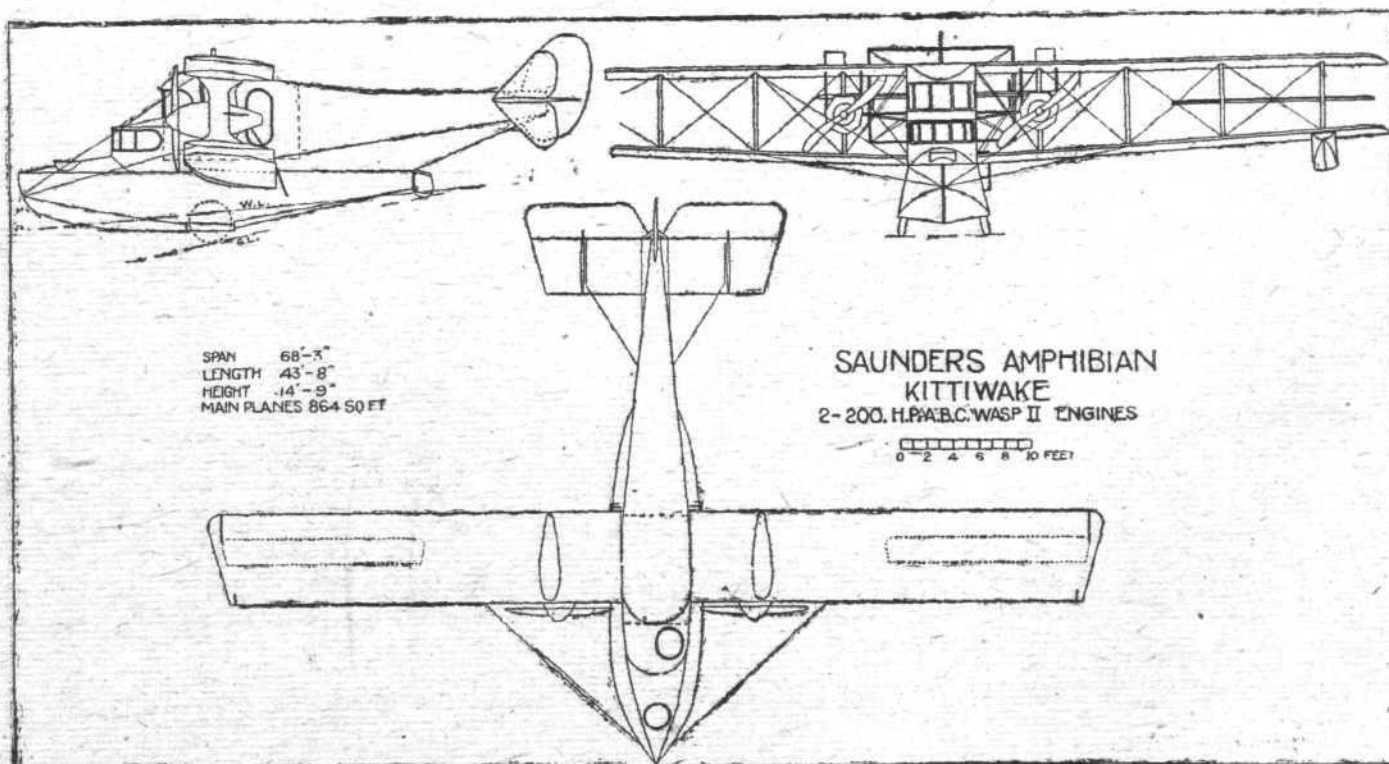


"Flight" Copyright.

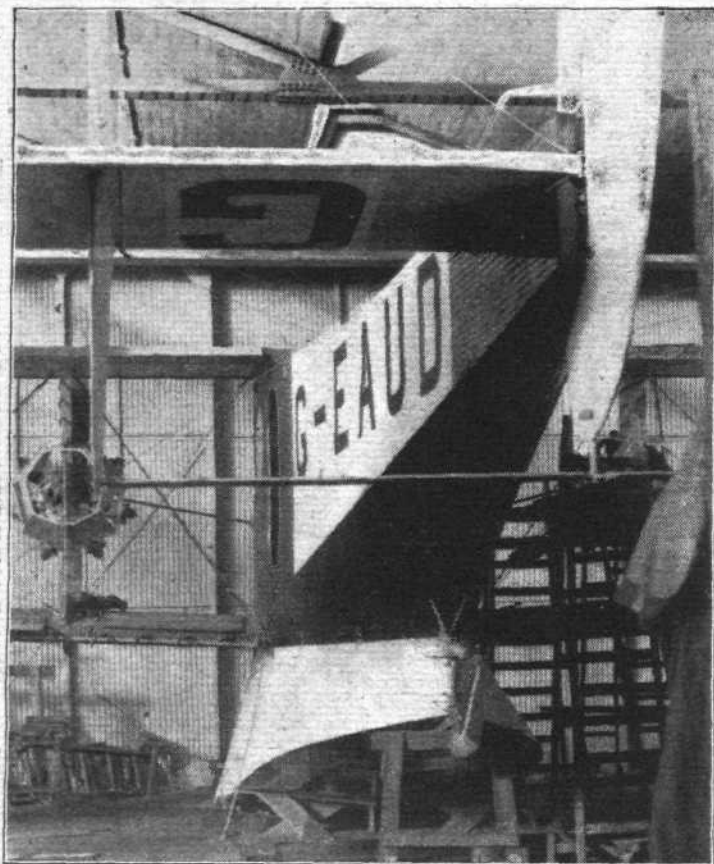
THE SAUNDERS "KITTIWAKE": Mounting and cowling of the A.B.C. "Wasp, Mark II" engine.

of the usual controls, while on his left are two wheels for operating the variable camber and the tail trimming respectively.

An ordinary crank handle is also provided for raising and lowering the land under-carriage, the two wheels of which are housed in slots in the boat hull, the water being kept out by spring-loaded doors in the bottom. The engineer is normally housed in the pilot's cabin, and can if necessary walk through the cabin and out on the wings to the engines. For anchor handling a small hatch is provided near the nose of the boat hull, while the pilot's cabin has another hatch in the roof.



"Flight" Copyright.



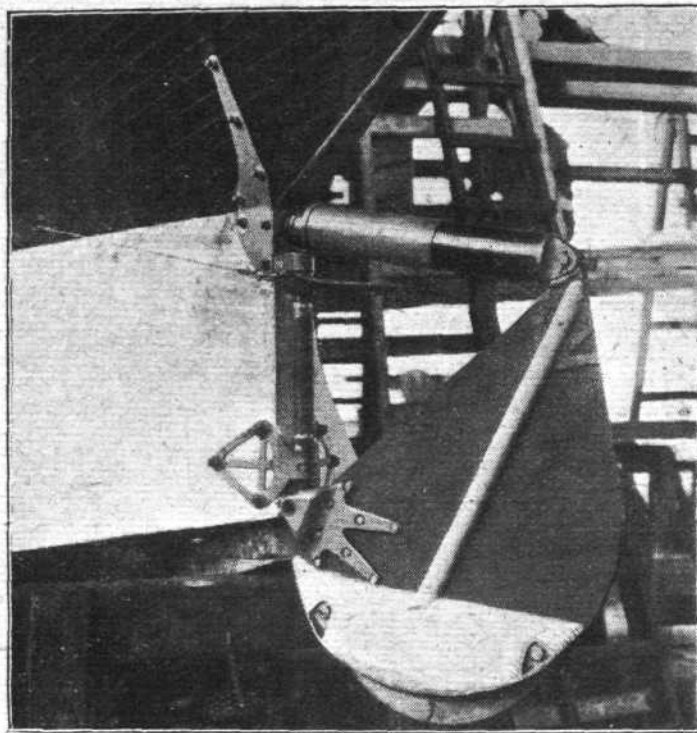
"Flight" Copyright

THE SAUNDERS "KITTIWAKE": View showing the aft portion of the planing bottom of the boat hull.

The Boat Hull

Not the least interesting feature of the "Kittiwake" is the general design of the hull, and the manner in which unit construction has been applied to this part of the machine. The hull is of the two stepped type, with the two steps very close together. Aft of the first step the bottom has a slightly more pronounced Vee than that of the front portion, while the Vee aft of the second step is the same as that between the steps.

Behind the steps the bottom remains of Vee formation, although the Vee flattens out somewhat towards the stern of the hull. The latter does not run right out to the stern post, but finishes off about half-way, the tail portion of the body being separate from the boat hull, which is joined to the body along a straight horizontal plane and forms a separate structure. Thus in the case of damage to the boat hull, this can be detached from the main body and a new one substituted, a feature which should be of considerable merit for a commercial machine. The fuselage



"Flight" Copyright

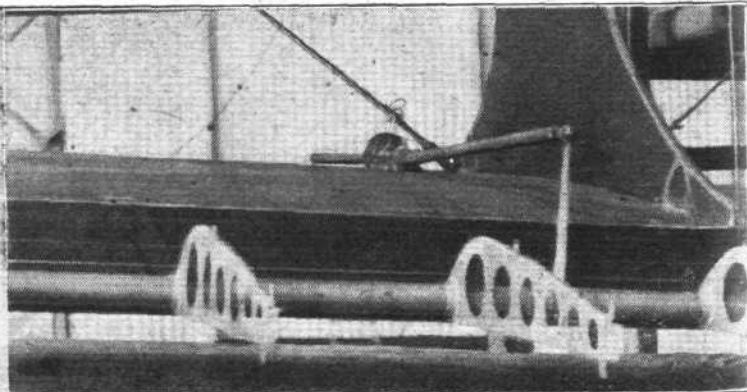
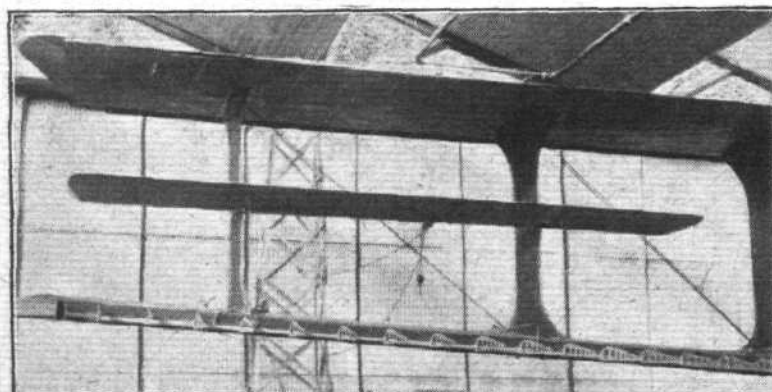
THE SAUNDERS "KITTIWAKE": View showing the general arrangement of the combined tail skid and water rudder.

proper extends back to the tail, and is of similar construction to that of the boat, i.e., a light framework covered with three-ply "Consuta." In the case of the fuselage and sides of the boat hull this Consuta covering is of cedar, while the bottom of the boat is covered with Consuta mahogany.

The fuselage has a slightly concave top aft of the cabin, a feature which one would imagine to tend to cause extra resistance, but according to wind tunnel tests on models of the complete machine, the total resistance is by no means high, and probably the variable camber wings effect such a saving in resistance as to afford considerable latitude in the various items of "parasite" resistance without bringing the total resistance up to a prohibitive figure. Thus the front of the cabin would appear to be very far from giving good streamline form, yet, as we have already said, the total resistance of the machine is certainly not unduly high.

The interesting Main Planes

Mention has already been made of the fact that the wings of the "Kittiwake" are of variable camber. This is not, however, the only interesting feature of the wings. The covering and strutting are also unusual. Instead of the ordinary fabric covering the planes are covered with Consuta



"Flight" Copyright

THE SAUNDERS "KITTIWAKE": The ailerons are placed between the planes as seen on the left, so as to allow of varying the entire wing camber. The camber of the wings is varied by pulling down leading and trailing edges. These are operated by a series of devices resembling in principle the ordinary turn-buckle as seen in the right-hand photo. Note also in the left-hand photo the single "I" strut.

cedar, which takes the place of the ordinary internal drag bracing. The leading and trailing portions of the planes, that is to say the portions in front of the front spar and aft of the rear spar respectively are separate structures of duralumin, and are hinged to the spars. The extreme edges are duralumin strips formed into U, or rather into rounded Vee sections in which the ply-wood covering is free to slide so as to accommodate itself when these portions of the wings



"Flight" Copyright

The Saunders "Kittiwake."—In the centre Mr. F. P. Hyde Beadle, chief designer; on the left Mr. H. W. Gravenell, asst. designer, and on the right Capt. H. Macmillan, pilot.

are flexed for varying the camber. The ribs of the front and rear portions of the wings are of duralumin and are pivoted by means of a duralumin tube running through the wing and hinged to the spars. At intervals these tubes are provided with cranks, which are in turn operated by means of the cambering gear. This takes the form of a series of longitudinal tubes, attached at their front and aft ends to the cranks on the transverse tubes, and at their inner ends to worms (left and right-hand) engaging with the internally threaded extension of the hub of a small toothed wheel. This wheel, in turn, engages with short racks on the operating rods running through the planes from the controls in the fuselage. Thus when the operating rods are caused, by the wheel in the pilot's cockpit, to slide laterally, they rotate the small toothed wheels, and these in turn cause the worms to travel outwards or inwards, thus flexing the leading and trailing edges up or down. As the overhanging leading edge is shorter than the trailing edge, the pitch on the front worms is greater than that of the rear worms, the gear being so arranged that the chord line of the section is at the same angle of incidence in both positions of the camber.

That the effectiveness of this variable camber, which, by the way, constitutes a patent, is considerable, is evident when it is pointed out that, according to wind tunnel tests on models of the complete machine, one with the camber flat and one with the maximum camber, the maximum speed with two 200 h.p. A.B.C. "Wasp II" engines should be between 105 and 110 m.p.h., while the landing speed is, according to the model tests, about 42 m.p.h. This would give a maximum lift co-efficient of close on .8, which is distinctly good, and in view of the necessarily considerable resistance of fuselage, hull, etc., the drag co-efficient of the wings with flat camber cannot be very great, so that this variable camber arrangement appears to be very well worth while.

The strutting of the wings is also unusual inasmuch as single I struts are employed. These are built-up of vertical and horizontal stringers and formers, covered with Consuta cedar. There is only one set of lift and anti-lift wires, which effects a considerable saving in resistance, and it is thought that this form of construction will be easier to keep aligned, since it does away with incidence wiring. Should, after long wear, the planes have warped to a certain extent, the trim of the

machine could probably be maintained by so setting the cambering gear as to give slightly greater lift on one side than on the other, thus restoring lateral balance. The method of anchoring the wing bracing streamline wires is interesting. There are no wiring plates, the threaded portion of the wires passing through the planes and being anchored there by a simple nut.

The tail plane is of the monoplane type, although it is braced by a form of triplane structure consisting of transverse stay tubes with streamline wire bracing. There are two heart-shaped fins, placed some distance out on the tail plane, and a single balanced rudder. As the fuselage stern is well above the water line, and the boat hull extends fairly far aft, there is no need for a tail float, but a combined tail skid and water rudder is hinged to the stern of the boat proper, as shown in one of our photographs.

The Engines

The power plant consists of two A.B.C. "Wasp Mark II." radial engines of approximately 200 h.p. each. They are mounted each on a single I-strut similar to the plain interplane struts, but differing from them in being built up of duralumin instead of wood. The engines are bolted to engine plates of duralumin, the feature which we like least in the whole design. Duralumin is known to become brittle with vibration, and also it should not be exposed to heat. However, if it is found to be unsatisfactory it will be a simple matter to substitute steel plates. The space aft of the engines is covered in by an aluminium cowl, and contains the oil tanks. The petrol tanks, as already mentioned, are mounted on the top plane. Each tank contains 54 gallons, or sufficient for a flight of about 4 hours' duration. This placing of the tanks, while being open to criticism from an aerodynamical point of view, has the great commercial advantage of reducing the risk of fire, while the petrol system becomes extremely simple, the fuel being fed to the carburettors direct from the main tanks by gravity.

Space does not permit of dealing in more detail with the "Kittiwake" this week, but it might be mentioned as something of an achievement that the machine was designed and built in three months. This does not sound very formidable until it is pointed out that the entire drawing office consisted of two men, Mr. F. P. Hyde Beadle the chief designer, and his assistant, Mr. H. W. Gravenell. Among them these two have got out all the working drawings, superintended the construction and—last but not least—have done all their own stress calculations. Those who have had anything to do with designing work will know what this means, and if ever downright hard work and honest endeavour merited success this is surely a case in point. And it is not as if the machine were along orthodox lines. The very novelty of the design necessarily meant coming up against endless snags, and presented a series of problems to be solved, and it may be taken for granted that only by working night and day were they able to do the job in the time at their disposal. It goes without saying that the workmanship is excellent throughout, as befits an old-established boat-building firm of such standing as S. E. Saunders, Ltd., whose boats are world famous. To Mr. S. E. Saunders also every credit is due for his courage in sanctioning the building of a machine so boldly conceived, and whatever is the fate of the "Kittiwake" at Felixstowe, everybody concerned is to be congratulated upon her production and will carry with them all the best wishes for success. To strike out along new lines at a time like the present is a venture which betokens not only far-sightedness but also a thoroughly sporting spirit, in the best sense of the word.



"Flight" Copyright

Mr. S. E. Saunders, the constructor of the "Kittiwake."

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

FLYING SERVICES FUND COMMITTEE

A MEETING of the Flying Services Fund Committee was held on Tuesday August 31, 1920, when there were present:—Group-Capt. C. R. Samson, C.M.G., D.S.O., R.A.F., in the chair, Lieut.-Col. Alan S. W. Dore, D.S.O., Mr. Chester Fox, and the Secretary.

Applications for Assistance.—Forty-five applications for assistance were considered, and grants and allowances voted amounting to £560.

COMMITTEE MEETING

A MEETING of the Committee was held on Thursday last, September 2, 1920, when there were present:—Brig.-Gen. Sir Capel Holden, K.C.B., F.R.S., in the chair, Lieut.-Col. Spenser D. A. Grey, D.S.O., Squadron-Leader T. O'B. Hubbard, M.C., R.A.F., Col. F. Lindsay Lloyd, C.M.G., C.B.E., Lieut.-Col. Mervyn O'Gorman, C.B., and the Secretary.

Election of Members.—The following New Members were elected:—

Mario Arioli.
Capt. Cecil Egerton Leigh (The Buffs).
Frederick Miller.

Flying Services Fund Committee.—The report of the Meeting of the Flying Services Fund Committee held on August 31, 1920, was received and adopted.

Fédération Aéronautique Internationale Conference, Geneva.—The following delegates are representing the Club at the Fédération Aéronautique Internationale Conference in Geneva on September 8, 9 and 10, 1920:—

Lieut. Col. F. K. McClean.
Lieut.-Col. Mervyn O'Gorman, C.B.
Major E. H. Tindal Atkinson.
H. E. Perrin.

FLYING MACHINES FOR THE USE OF MEMBERS

The Club has arranged with the Aircraft Disposal Company for the exclusive use of six flying machines for the Members. The following types have been selected:—Sopwith Pups, Avro, B.E.2d and Armstrong-Whitworth. These machines will be kept at the Handley-Page Aerodrome, Cricklewood.

All enquiries relating to hiring should be addressed to the Secretary of the Club.

Airway Upkeep, etc.

In the course of a statement in the French Chamber recently the Assistant Secretary of Aviation stated that the cost of upkeep of aerodromes, hangars, repairing shops, meteorological and wireless stations on the French portion of the Paris-London service was estimated at 20,000 francs per kilometre as against the cost of 500,000 francs per kilometre of a single line of railway. He thought that in future the total cost of organising an aerial service would be 10,000 francs per kilometre. On the other hand he emphasised the difficulties due to present heavy charges on flying plant, the French calculation of the life of an aeroplane being 200 flying hours, which meant that about 3.50 francs per kilometre had to be added to the total cost of the service. This, however, he had hopes of seeing reduced.

The Bleriot Mammoth Flies

LIEUT. CASALE last week put the Bleriot Mammoth through some tests for the French Section Technique Aéronautique. It is stated to have flown for 40 minutes, to have risen 2,000 metres in a quarter of an hour, and attained a speed of 150 kilometres per hour at an altitude of 1,000 metres.

Mdlle Boland Flies Home

HAVING had the engine of her Caudron put right, Mdlle Boland flew the machine from Westenhanger to Croydon. She left Croydon in company with another machine from the Caudron flying school at 4 p.m. on August 31, but after getting as far as Lympne it was decided not to go on. The Channel was crossed the next morning, and the two machines landed safely at Le Crotoy.

GORDON-BENNETT AVIATION RACE

THE Gordon-Bennett Aviation Race will be held at Ville-sauvage, near Etampes, about 30 miles south of Paris, on September 28, 1920, and the United States, France and Great Britain will each be represented by three machines.

The Club has selected the following competitors to represent Great Britain:—

| Pilot | Machine | Engine |
|----------------|--------------------------|----------------------------|
| H. G. Hawker | Sopwith-Jupiter | 450 h.p. Bristol-Cosmos. |
| F. P. Raynham | Martinsyde "Semi-Quaver" | 300 h.p. Hispano-Suiza. |
| L. R. Tait Cox | Nieuport "Goshawk" | 320 h.p. A.B.C. Dragonfly. |

BUC MEETING, OCTOBER 8, 9 AND 10, 1920

The Aero-Club de France is arranging a Meeting for French Competitors at Buc on October 8, 9 and 10, 1920. On October 10 there will be a race for transport machines on the lines Paris-Brussels and Paris-London.

The machines will fly from Buc to London or Brussels and return on the same day.

Machines flying on the Paris-London line will land at Waddon Aerodrome, Croydon, and at the request of the Aero-Club de France, the Royal Aero Club will control the competition at the London terminus.

The following is an extract from the regulations:—

"Machines must conform to the following conditions:

"Postal machines (machines carrying postal bags only) to carry a load of at least 50 kgs.

"Transport machines to carry a minimum of two passengers in addition to the crew; the passengers must be at least 18 years of age. On the outward journey the passengers must be on board; on the return journey each passenger may be replaced by 100 kgs. of ballast. In the case of machines of 500 h.p. or more, the crew must consist of at least two persons.

"Starts will be made at Buc on October 10 between 10 and 11 a.m., at times selected by the competitors, except in the case of several competitors choosing the same time, when the order of entry will be taken.

"The competition closes at 6 p.m."

Offices: THE ROYAL AERO CLUB,

3, CLIFFORD STREET, LONDON, W. 1.

H. E. PERRIN, Secretary.

A French Dirigible to Visit Brigue

In connection with the forthcoming unveiling of the Chavez monument at Brigue, the French Government has asked permission from the Swiss Government to send a dirigible to the ceremony. The Swiss authorities have replied favourably, but pointing out the grave dangers due to the violent wind currents in the Brigue district.

German Machines for Japan

It is expected that Japan will receive her share of aircraft surrendered by Germany, before the end of the year, and that it will include 50 aeroplanes, among them some of the most recent types. The Japanese Government has voted a credit of 500,000 yen for the construction of hangars at the military aerodromes of Tokorozaiva and Kagamigahara, to shelter the machines when they arrive in Japan.

A Desert Mystery

WORD has reached Thetford that the body of Air-Mechanic Percy Thackery, R.A.F., of Thetford, Norfolk, has been found by the Camel Corps on the mountains near Nekhl, in Sinai. He left Ramleh in a Bristol Scout aeroplane with an officer on June 14 for Ismalia, but never reached there. No trace has been found of the aeroplane.

To Make a Map of Calcutta

THE Calcutta Improvement Board is seriously considering the question of arranging with a firm for the use of a Handley-Page machine to enable an accurate map to be made of the city and its surroundings.



AIR MINISTRY NOTICES

Aerodrome List Amendments

ADDITIONS and Amendments to Notice to Airmen, No. 81 (Consolidated List of Aerodromes), of July 20, are as follows:—

Aerodrome.

| Name. | Lat. | Long. | Height above Sea Level. |
|----------|-----------------|-----------------|-------------------------|
| Anglesey | 53° 15' 0" N... | 4° 22' 30" W... | 185 ft. |

LIST B (b).—(b) Stations temporarily retained for Services purposes.

The following should be deleted:—

| Nearest Town. | Distance from Aerodrome in Miles (by road). | True Bearing from Aerodrome. |
|---------------|---|------------------------------|
| Llangefni | 3 miles | E. |

LIST C (b).—Civil Aerodromes licensed as "Suitable for Avro 504K and similar types of aircraft only." Except in very few cases accommodation does not exist.

Aerodromes.

| Name. | Lat. | Long. | Height above Sea Level. |
|-------------------------|-----------------|-----------------|-------------------------|
| Taunton, Musgrove Farm. | 51° 1' 0" N. .. | 3° 7' 0" W. .. | 60 ft. |
| Herne Bay | 51° 22' 0" N... | 1° 8' 30" E. .. | 100 ft. |
| Walsall.. | 52° 35' 0" N... | 1° 57' 0" W. .. | 460 ft. |
| Nuneaton | 52° 31' 0" N... | 1° 27' 0" W. .. | 300 ft. (approx.) |
| Wellingborough | 52° 18' 30" N. | 0° 40' 0" W. .. | 200 ft. |

The licences have also been issued for limited periods only. Foreshore Aerodromes are not included.

The following should be added:—

| Nearest Town. | Distance from Aerodrome in Miles (by road). | True Bearing from Aerodrome. |
|----------------|---|------------------------------|
| Taunton | 1 mile | W. |
| Herne Bay | 2 miles (S.E. & C.R.) | W. |
| Walsall | 2 miles (L.N.W.R.) | W. |
| Nuneaton | 1 mile (L.N.W.R.) | W.N.W. |
| Wellingborough | 1 mile (M.R.) | W.S.W. |

Issue of Meteorological Reports by Wireless Telegraphy

1. On and after September 1 the synoptic reports issued by W/T from the Air Ministry and Aberdeen will be as follows:—

Air Ministry.—Call sign G.F.A. Wave length, 1,400 m. continuous wave. Times of issue: 0315, 0845, 2015 G.M.T.
Aberdeen.—Call sign, B.Y.D. Wave length, 3,300 m. Times of issue: 0230, 0830, 1430, 1930 G.M.T.

2. Reports will be sent for the following stations:—

| Place. | Identification Number. | Place. | Identification Number. |
|------------------------|------------------------|----------------|------------------------|
| Lerwick.. | 101 | Scilly .. | 166 |
| Aberdeen* | 110 | Pembroke .. | 169 |
| Tynemouth | 118 | Holyhead .. | 174 |
| Manchester (Didsbury)* | 128 | Glasgow* | 178 |
| Cranwell* | 131 | Malin Head .. | 182 |
| Yarmouth | 136 | Baldonnel* | 184 |
| Felixstowe* | 143 | Valencia* | 192 |
| Calshot* | 153 | Stornoway .. | 195 |
| Lympne* | 154 | Ross-on-Wye .. | 198 |
| Croydon | 159 | Blacksod Point | 199 |
| Jersey .. | 160 | | |

* See paragraph 4.

3. The identification number of each station will be followed by three groups of five figures represented symbolically by BBBDD FwwTT βbbHV, where BBB=Barometer in millibars and tenths (initial 9 or 10 omitted). DD = Wind direction at surface on the scale 0-32 (08 = E 16 = S, 20 = S.W., etc.). F = Wind force on Beaufort Scale. ww = Present weather (see Code 1). TT = Temperature in degrees Fahrenheit. β = Characteristic of barometric tendency (see Code 2). bb = Amount of barometric tendency in half millibars (50 added for negative tendency). H = Humidity (see Code 3). V = Surface visibility (see Code 4).

A hyphen - (morse signal - ... -) will be used in the place of any missing figure.

4. In the case of stations marked * a fourth group will be

added, when possible, as follows: 2 DDVV, where DD = Direction of wind at 2,000 ft. on the scale 0-72. Actual direction in degrees from North is obtained by multiplying code figures by 5. VV = Speed of wind at 2,000 ft. in miles per hour.

5. Four codes are attached to the notice. The fog scale is that given in Annex G of the Convention for International Air Navigation.

6. General inferences in plain language, based upon observations at 0700 and 1800 G.M.T. will be issued by Air Ministry Wireless Station at 0915 G.M.T., 2000 G.M.T.

7. The following is an example of such an inference: "Pressure has again become high over Iceland, and a deep depression over the Skagerak region is increasing in intensity. The resultant North-Westerly to Northerly wind current over the British Isles will maintain rather cold weather, with local showers and variable skies during the next day or two."

8. Notice to Airmen, No. 58, of May 31, 1920, is hereby cancelled.

(Notice to Airmen, No. 94.)

Log Books for Civil Flying

It is hereby notified:

In accordance with the provisions of the Air Navigation Regulations, 1919, Schedule 5, Standard Log Books have now been prepared for use by firms, pilots and others engaged in civil flying and are available at the prices shown:—

Pilot's Log Book. C.A. Form 24. Price 2s.
Journey Log Book. C.A. Form 26. Price 4s.
Aircraft Log Book. C.A. Form 27. Price 3s. 6d.
Engine Log Book. C.A. Form 28. Price 3s. 6d.

The books are obtainable through any bookseller or direct from H.M. Stationery Office, Imperial House, Kingsway, London, W.C.2, or their agents.

N.B.—This Notice cancels Air Ministry Communiqué No. 381 of November 14, 1919, which authorised temporarily the use of R.A.F. type Log Books.

(Notice to Airmen, No. 92.)

New York to California and Back

OF the three J. L. (Junkers) all-metal monoplanes which set out from New York on July 29 to fly to the Pacific Coast, two reached Oakland, California, on August 8, and one returned to New York on August 25. The flying time on the return journey was 59 hours.

Zeppelin may go round the World

FROM a statement made by Major C. J. Glidden, of the Aero Club of America, it seems that the Zeppelin Company have for a long time cherished the ambition to be the first to make the first trip by aircraft right round the world, and, unless prevented by the Allies, they hope to attempt the trip within the next twelve months.

Help for Chile's Air Force

ABOUT 2,000,000 pesos (£101,000 approximately) has been raised in Chile by popular subscription for the purchase of aeroplanes for the Army and Navy, and representatives of all nationalities subscribed.

Double Fatality with Junkers Machine

WHILE one of the J.L. (Junkers) all-metal monoplanes, now engaged in the U.S. mail service, was flying from New York to Cleveland, Ohio, on September 1, it crashed in a street at Morristown, N.J., and the two occupants were pinned beneath the wreck and burnt to death. The machine was observed to be flying at a low altitude and apparently engine-trouble was being experienced. As the machine hit the ground there was a loud explosion.

NOTICES TO GROUND ENGINEERS

It is announced (No. 1) by the Air Ministry that the question of acquainting ground engineers with such technical information in connection with civil aircraft as is essential to the efficient discharge of their duties has been under consideration by the Air Council, resulting in a decision to issue such information periodically in the form of "Notices to Ground Engineers" in a similar manner as information of importance to pilots is now issued in the form of "Notices to Airmen."

"Notices to Ground Engineers" will contain information as to the embodiment of modifications affecting the safety of aircraft and such points in regard to inspection as have been shown by experience to require special attention.

These "Notices" will be issued to all owners of aircraft and to such public bodies as are interested. In order that the information circulated in this manner may be of value it is essential that it should reach all licensed ground engineers, and it is therefore incumbent on owners of aircraft as the employers of persons giving certificates of fitness before flight to see that the "Notices" are communicated to and observed by all such persons in their employ. Further, all ground engineers when receiving their licences for the first time will be advised to ask their employers to acquaint them with these "Notices."

(No. 2) Petrol-Resisting Rubber Tubing and Connections

ATTENTION is called to the necessity of frequent examination of all Petrol-resisting Rubber Tubing and Connection used on aircraft to convey petrol, oil, or hot water. Engine failures in the air have been traced to the use of this material when in a deteriorated condition.

Service conditions during the War have shown that this material must be regarded with suspicion after having been in use for a period of four months for sizes up to $\frac{3}{4}$ -in. bore and six to nine months for larger sizes.

This tubing should conform with the requirements of the British Engineering Standards Association Specification No. 2.F.7 in which the requisite number of canvas plies should not be less than two for the $\frac{3}{4}$ -in. bore size, not less than three for bores $\frac{1}{2}$ -in. to $1\frac{1}{2}$ -in., and not less than four for larger sizes.

The most efficient test of this tubing is to boil a portion of the tubing in petrol for one hour, to be followed by immersing in cold petrol for a period of 24 hours, after which the sample should be examined for the quality of rubber, swelling, and adhesion of rubber to canvas. Where it is not possible to carry out such a test, an indication of the condition may be obtained by "picking" at the end with the thumbnail, thereby enabling brittleness and lack of adhesion of rubber to the canvas to be detected.

Owing to the tendency of this tubing to perish when subjected to extreme temperatures or strong light, it should always be stored in a dark place at a normal temperature and should be coiled in such a manner as to prevent "kinking."

(No. 3) Streamline Wires

STREAMLINE WIRES may be damaged whilst being adjusted owing to pliers being employed either to turn the wires or to hold them whilst securing the lock-nuts. The rough jaws of the pliers make comparatively deep cuts in the surface which develop into cracks after being subjected to vibration in flight, and which ultimately cause the wires to fail.

To obviate such failures a special tool for holding or turning the wires should always be used, and on no account should pliers be employed for this operation.

Cases have occurred where a wire has been twisted at one end during adjustment, and in one instance a wire was found to have four complete turns in its length. Twisted wires have their strength seriously reduced, and in addition they no longer fulfil their streamline functions.

Care is necessary to ensure that the fork ends used on the smaller sizes of wires are not opened out during adjusting.



New York to San Francisco Service

THE new service between New York and San Francisco was due to start on September 8, and it is hoped that by this means it will be possible to reduce the transit time for mails from 91 to 57 hours in winter, and from 91 to 54 hours in summer. The distance is 2,651 miles, and leaving New York at 5.30 a.m., the aerial postman is due at San Francisco at 2 p.m. on the third day out.

Fighting Forest Fires

As part of the regular equipment for the protection

If a fork is damaged in this way it should not be closed in to make the shackle pin fit, but a new fork end should be provided before the machine is flown.

(No. 4) Safety Belts and Harness

ATTENTION is drawn to the necessity of ensuring that the fitting and maintenance of safety belts and harness in aircraft is secure and functions correctly.

Service conditions have shown the necessity of any belt or harness safely withstanding a tensile load of 500 lbs. without visible signs of fracture, and that the release gear is capable of operating when the belt is under a load of 200 lbs. In consequence, anchorage fittings should be of the same strength.

Where ropes are used for attaching the belts the strength of the rope should be approximately 10 cwts. "Lapped" joints in ropes are considered unsatisfactory and the use of ropes which allow of a spliced or "whipped" joint is more satisfactory. In all cases of "whipping" good quality kite cord should be used and the "whipping" carried out while the joint is under tension in order to minimise the slip when subjected to subsequent strain. All loose ends of ropes should be "served" to prevent fraying, and in no case should a rope be connected directly to a plate where chafing may occur.

Anchorage plates, where secured by bolts, should be so arranged that the shear is taken near the bolt head instead of the screwed end, as cases have arisen where the plates bearing on the screwed end have sheared the bolt. The minimum diameter of any bolt to be used in anchorage fittings should be 2 B.A. The fixing of an anchorage plate or connection to the middle of a structural member should be avoided, and the belt should be so arranged as to sustain the upper part of the body.

The release gear on the belt should always be correctly positioned for easy manipulation and should be maintained in a lubricated condition.

The leather portions of the belt should be periodically treated with linseed oil or wax.

(No. 5) Control Pulleys and Running Cables

PARTICULAR attention should be given to control pulleys and running cables on machines operating from the seashore or sandy places.

The cables in the vicinity of pulleys and leads should not be greased on these machines owing to the cutting action of the sand and grit which adheres to the grease.

(No. 6) Arrangement of Oil Filter on Aeroplanes Fitted with Napier "Lion" Engine

CERTAIN aeroplanes fitted with the Napier "Lion" engine have the oil filter so fitted that the top of the filter is approximately level with the top of the oil tank. The oil pipe from the tank leads to the bottom connection on the filter body and the top connection takes the pipe leading to the oil pump.

This arrangement allows the possibility of an air lock forming in the pipes, and if, therefore, any aeroplanes are still in service with the filter fitted as above, the pipes should be re-arranged so that the oil pipe from the tank should lead to the top connection of the filter and the bottom connection should lead to the oil pump.

If, however, the oil tank is fitted above the pressure oil pump inlet, a cock should be fitted in the pipe between the filter and the oil tank. This cock should be capable of being locked in the open position.

It is further recommended that a warning plate should be fixed in a conspicuous position in the pilot's cockpit, directing attention to the necessity for opening the cock before starting the engine and for closing the cock on completion of engine running. This latter precaution is necessary to prevent oil draining from the oil tank through the pump gears and flooding the engine sump.

of the forest areas, Quebec now has six waterplanes, equipped for patrolling purposes. They carry fire-fighters during their trips over the provincial forests.

An Aerial Survey of the U.S.

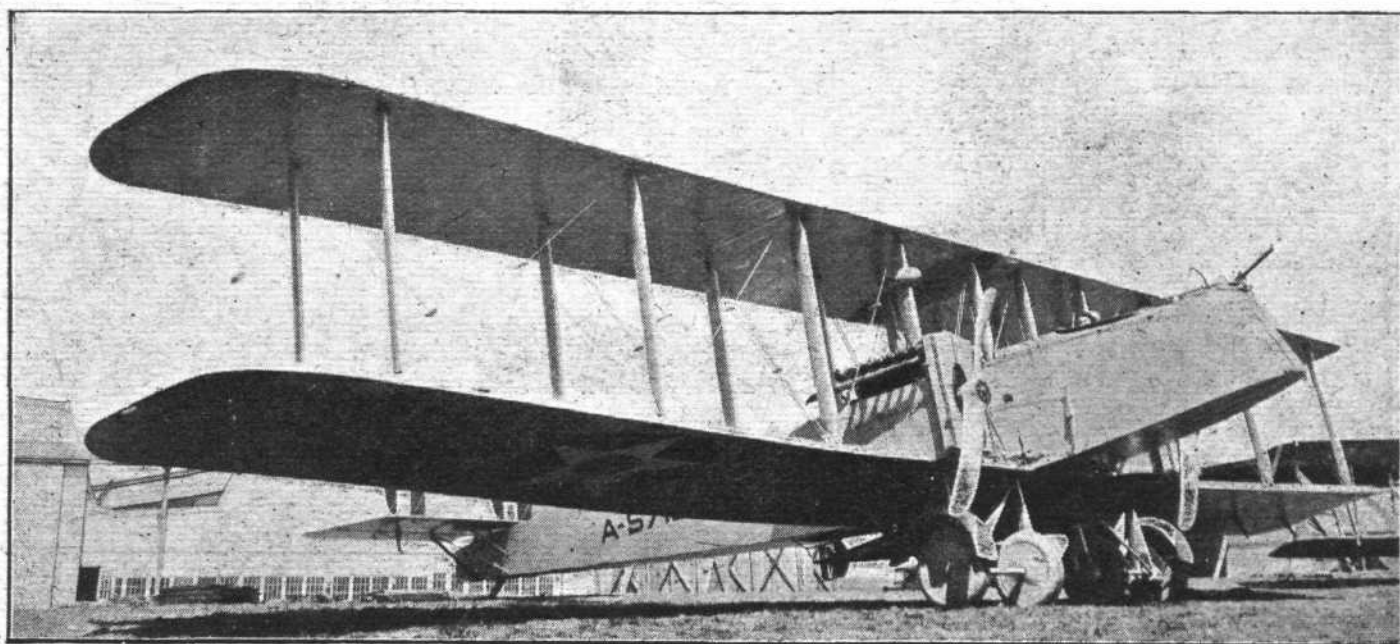
STEPS are being taken in regard to the making of a geological survey of the United States by the aid of aeroplanes. The participation of New York in the survey will necessitate about ten stations being established, or one to every 8,000 sq. miles. The estimated cost of producing the necessary photographic maps has been figured out at anything from \$5 to \$10 per sq. mile.

THE GLENN-MARTIN NAVY TORPEDO 'PLANE

THE Glenn L. Martin Co., of Cleveland, Ohio, U.S.A., recently completed a new type of torpedo 'plane for the U.S. Navy. Final trials, before Army and Navy officials, were carried out with success on May 6 last at McCook Field, Dayton. This type of machine is intended for operation either with the fleet or directly from shore stations. It is not fitted with floats, but in addition to the specially designed landing gear it is provided with emergency flotation bags, inflated by compressed air, so that it can, when required, alight on the water.

a return trip impossible, the 'plane can alight on the water, by means of its flotation gear, and signal its home station, or any nearby ship, as to its location.

The Martin Navy torpedo 'plane is essentially a land-type, twin-motored, tractor bi-plane, designed to carry a 2,100-lb. torpedo (or the equivalent weight in torpedo and bombs), two machine-guns complete, radio equipment, a crew of three men (pilot, navigator, and gunner), and sufficient fuel for 480 miles cruising radius. In addition, it carries 450 lb. of bombs, two Lewis machine-guns, a

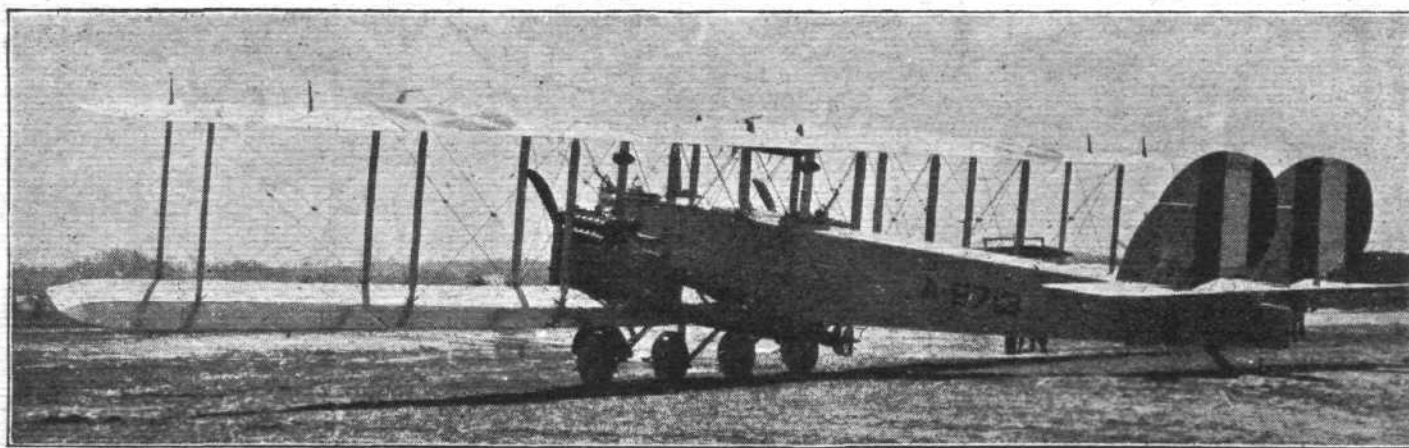


THE GLENN-MARTIN NAVY TORPEDO 'PLANE : Three-quarter front view

When operating with the fleet, the machine, fully loaded, can, it is claimed, take off from the deck of a warship or seaplane carrier. Its cruising radius of 480 miles permits a reconnaissance of several hundred miles, during which communication with the base can be maintained by means of radio equipment. On sighting an enemy ship, the plane sweeps down and launches its torpedo at comparatively

radio set, and a complete equipment of instruments and accessories.

This new type of torpedo 'plane has several recent developments, such as folding wings, which when folded reduce the over-all width of the 'plane to 35 ft. 10 in.—thus minimising the space required for housing. Another new feature is found in the landing-gear, which is divided in the middle so



THE GLENN-MARTIN NAVY TORPEDO 'PLANE : Three-quarter rear view

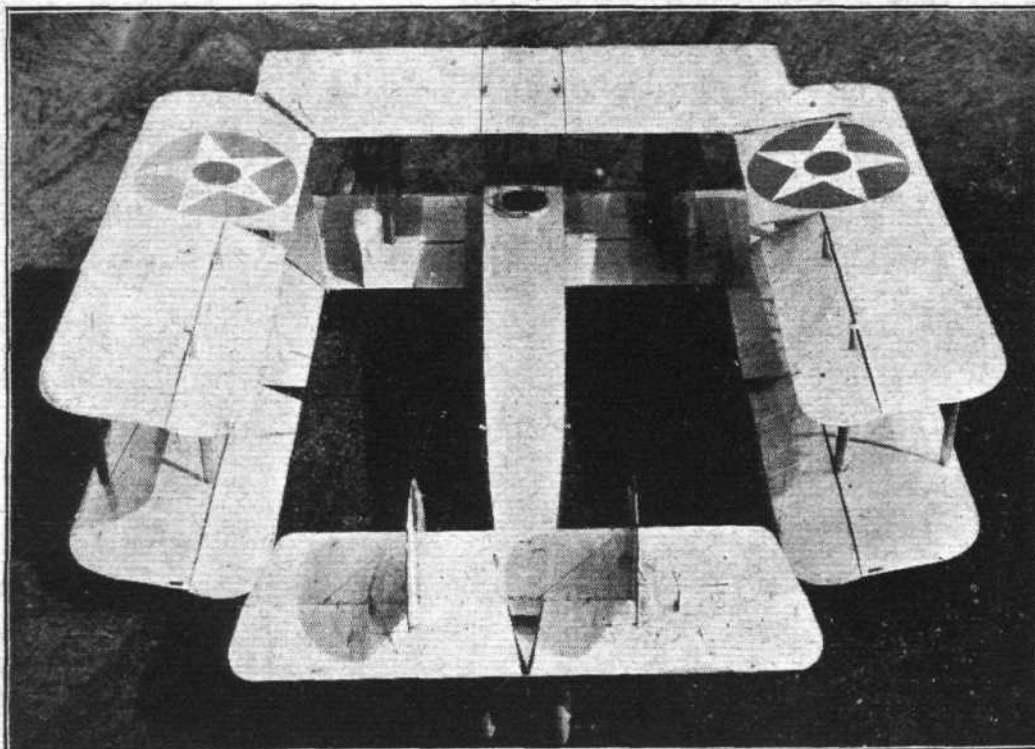
close range, and then flies back to the mother ship. Having returned—all being well!—it alights on the water on the lee side of the ship, and is hoisted on board by means of attachments on the top plane.

As a coast defence unit it, practically speaking, takes the place of coast defence guns, and the average range of the latter being 20 odd miles, the 'plane scores somewhat with its 200-mile range—to say nothing of the difference in cost. Should an engagement take place so far out to sea as to make

as to permit the torpedo cradle, carrying the torpedo, to be suspended underneath the fuselage.

The two 12-cylindred Liberty engines are mounted on the lower front wing beams just outside of the first wing strut away from the fuselage. By mounting the motors in this manner the centre of gravity is lowered, the flying efficiency is increased, and the motors are made more accessible than they would be if they were suspended from the upper wings or between the struts.

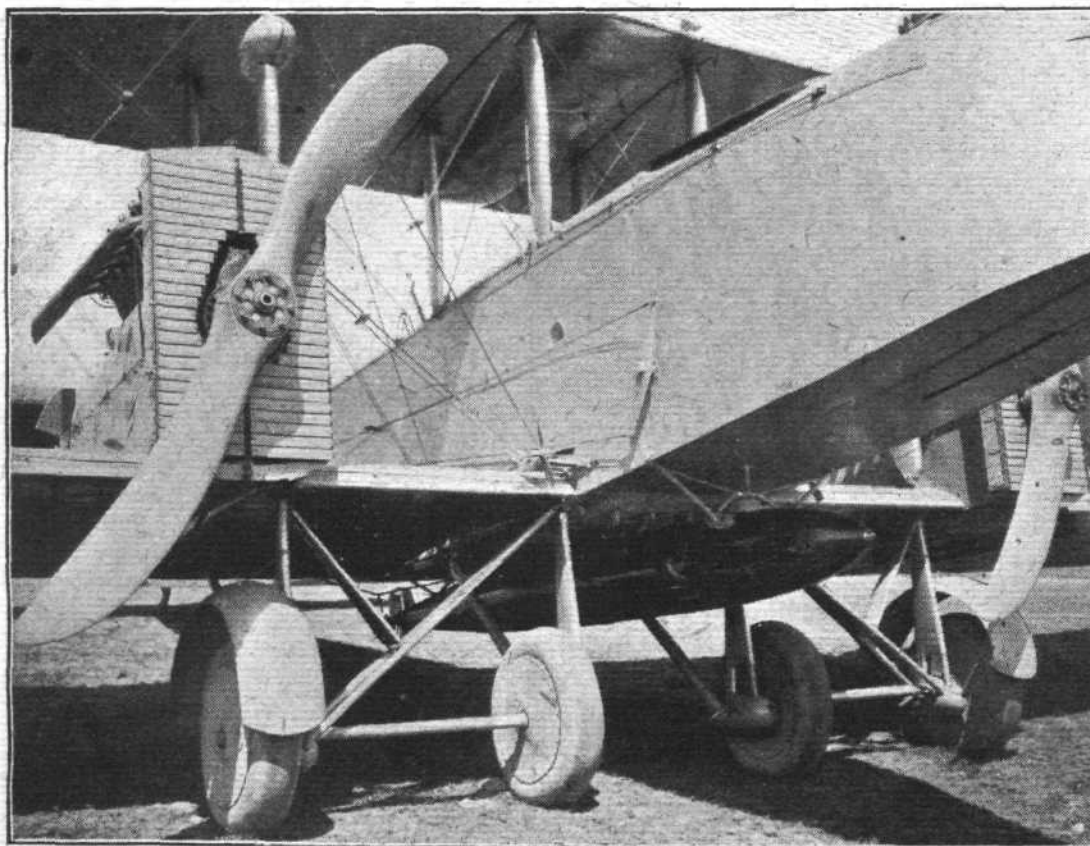
The Glenn-Martin
 Navy Torpedo
 'Plane: View of the
 machine with the
 wings folded



The principal characteristics of the Martin torpedo 'plane are:—

| | | | |
|---------------------|----|----|----------------|
| Span, over all | .. | .. | 71 ft. 5 ins. |
| Width, wings folded | .. | .. | 35 ft. 10 ins. |
| Over-all length | .. | .. | 46 ft. 4 ins. |
| Over-all height | .. | .. | 14 ft. 0 ins. |
| Weight, empty | .. | .. | 6,533 lb. |
| Load, useful | .. | .. | 4,950 lb. |
| Weight, gross | .. | .. | 11,487 lb. |

| | | | |
|---|----|----|------------|
| Crew | .. | .. | 4 men. |
| Factor of safety | .. | .. | 5 to 7. |
| Maximum speed | .. | .. | 107 m.p.h. |
| Economical speed (at sea-level) | .. | .. | 95 m.p.h. |
| Landing speed | .. | .. | 60 m.p.h. |
| Climbing speed (from sea-level in 10 mins.) | .. | .. | 5,100 ft. |
| Cruising radius | .. | .. | 480 m. |
| Service ceiling | .. | .. | 12,000 ft. |
| Absolute ceiling | .. | .. | 10,000 ft. |



The Glenn-
 Martin Navy
 Torpedo 'Plane:
 Close-up view,
 showing the
 2,100-lb. torpedo
 in position

More Weather Stations

THE Meteorological Office, which is now a department of the Air Ministry, is to open a series of branch stations in different parts of the British Isles, where district weather reports will be issued. Thus the functions now performed by the London office will be localised, general information

concerning the weather all over England being sent to the various stations by wireless; observations will also be made at these stations.

For the south of England Calshot has been selected as the site of a station, and for the south-western districts Plymouth will be the centre.

AERONAUTICAL CAMOUFLAGE*

BY WM. R. WEIGLER, Chief of the Camouflage at McCook Field

CAMOUFLAGE is a definite thing. When applied to air machines of war it increases their effectiveness and efficiency, prevents the loss of planes in combat and protects the lives of pilots.

The factors entering into the correct solution of the camouflage problem are the functions of the plane, its visibility and the psychological effect of this deception or camouflage on the human mind. Aircraft generally function as either day or night machines. They are painted so as to be low in visibility or to confuse the mind. Whether or not

Aircraft functioning during the day should be protected by a double system of camouflage. In going to and from active duty it is often necessary for the plane to travel over considerable distances, during which time the plane is generally in a horizontal position; therefore, when seen from below, the plane is silhouetted against the sky as a background. The lower or under surfaces of the plane are of course in shadow. It is, therefore, necessary, that all under-surfaces of such planes be coated with some material that would be as bright as possible and would reflect back to the earth not only a large quantity of light, but also the colour of the sky. If the camouflage could equal in brightness and colour that of the sky, we could safely say that we have produced low visibility of the plane when seen from below. We have in this manner protected it from enemy planes flying beneath it and from anti-aircraft guns over which it must pass. Of course the complete invisibility, just described, is ideal, and does not exist, but it has been worked out on models under conditions which approximate those illustrated above, with the result that a plane that would normally disappear at an altitude of 20,000 feet so camouflaged would disappear at 15,000 feet, thus giving the plane the range of invisible activity of 5,000 feet. This is an enormous advantage for aircraft operating under war conditions, as it places the pilot of the plane in a

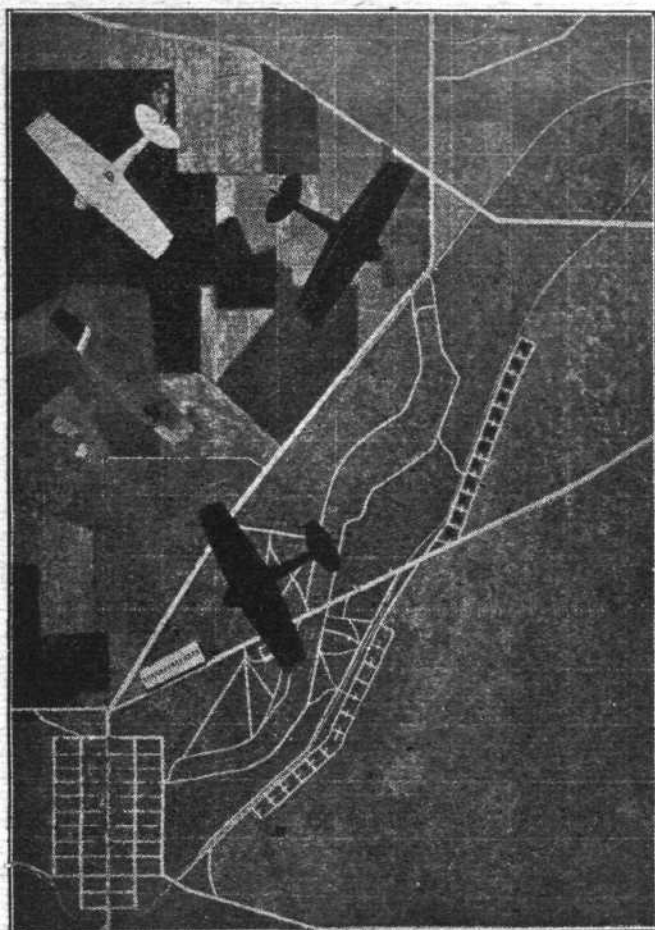


Fig. 1.—Showing comparative visibility of models with various "colourings"—from top, clear varnish dope, black, multi-coloured, and khaki

camouflage itself is effective depends upon the elimination or distortion of the shadows, the use of the correct colour, with the proper light absorption and reflecting qualities.

Certain scientific facts have been established in relation to camouflage. Measurements have been taken over large areas of terrain with the view of obtaining reflection factors of light from various sources. Other measurements which will give in terms of wave-length of light and thereby defining definitely the colour of the reflected light from fields, water, etc., are proposed, so that camouflage no longer is a purely artistic endeavour, but becomes a subject based on a thorough study of scientific facts and data.

Camouflage or protective coloration exists in nature to a very great extent. The design of aircraft camouflage closely follows one or two of these natural examples, namely, colour schemes of the snake or fish. Both are round in form, and in general have two distinct systems of coloration—one on the top, a mottled coloured pattern, and the other on the under-side, a light tone of colour, blending on the sides so as to eliminate all shadow effects. Probably the closest example is the fish, with its dark or coloured back, which is seen in comparison with the dark water and stream bottoms, while on the other hand light colours are found on the under-sides which blend with the lighter colours of the water when viewed from beneath.

* From *Aerial Age*, U.S.A.

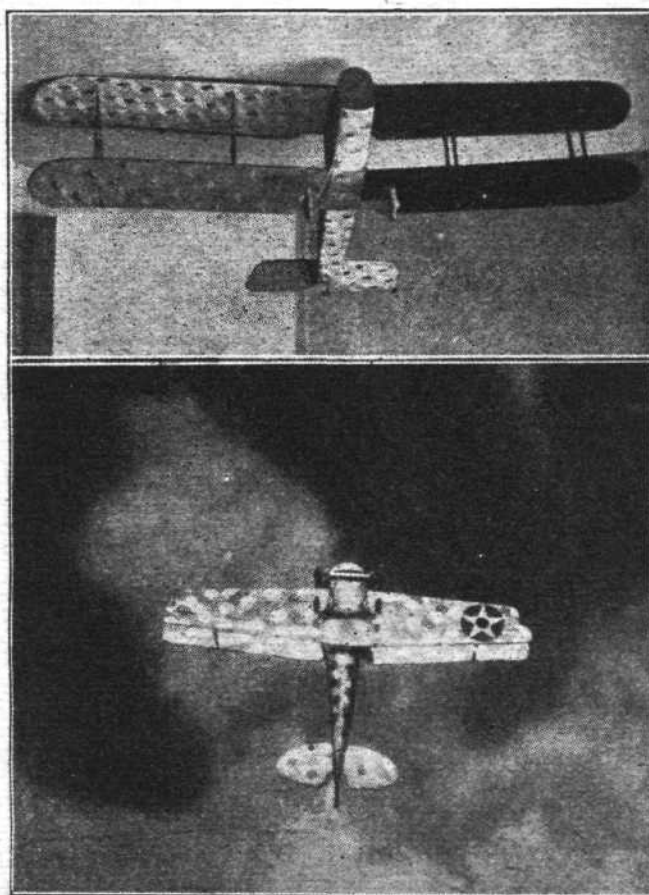


Fig. 2 and Fig. 3.—Model showing comparison of sky camouflage with non-camouflage (top), and similarly camouflaged model in direct contrast with sky (bottom)

position to observe without being observed with the additional advantage that a plane can operate with a greater load if the ceiling at which it must travel can be lowered.

The second phase of camouflage development considers the plane as seen from above with the earth as a background. In order to obtain low visibility, it is necessary to apply a coat to the plane which will have the property of making it merge or fit into this earth-coloured background. The problem is not easy, as a plane moving over country is continually changing its environment. At one time a clump of trees or woods forms its background, and at another a green field or a body of water. All these must be taken into consideration, and the final coating must contain that

imply that a greenish yellow is the most visible colour at all times, for, as pointed out before, the environment of colours plays a very important part in the visibility of that colour, and it can readily be seen that a greenish yellow square of paper, if placed on a background of the same colour, will become invisible and merge into that background much quicker than a violet piece; here actual visibility is near the bottom of the curve.

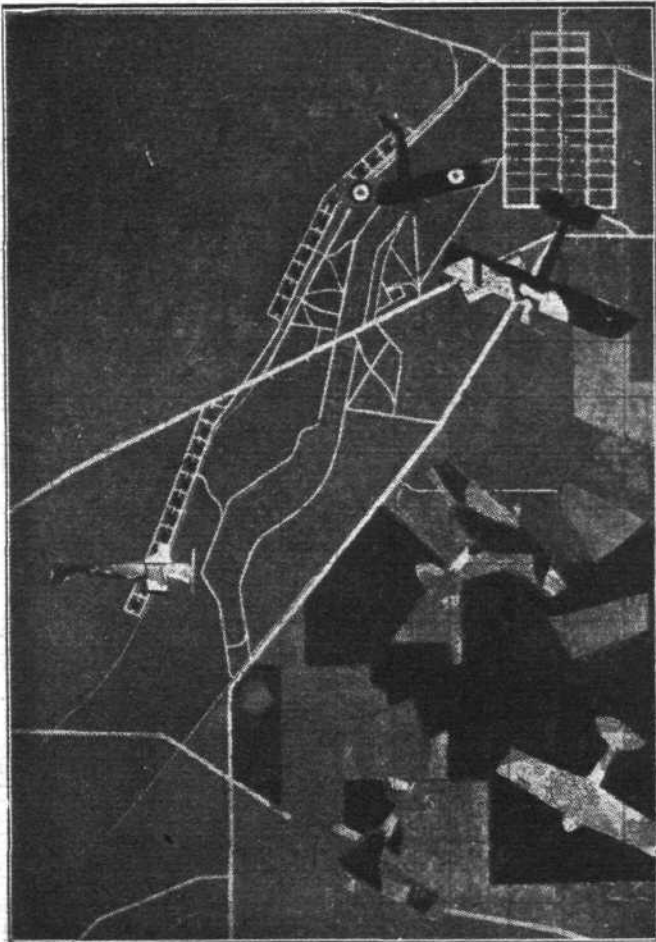


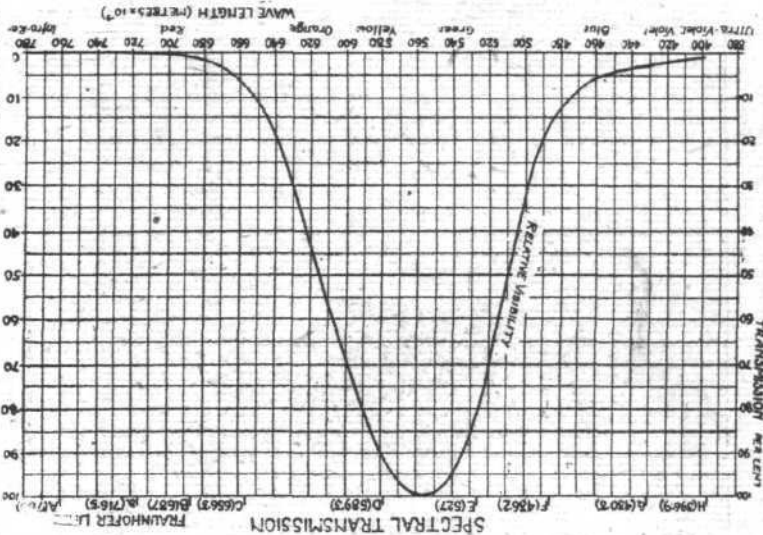
Fig. 4.—Effect of insignia on the visibility of a plane, showing, in the lower left-hand corner, a D.H. with a new type of insignia and a Spad with the usual two circular insignias

As shadows bear a direct geometric relation to the object which cast them, they often reveal a body when it other- wise would be concealed. Due to the reduction of light in the shadow, a line or edge casting it very often stands out in peculiar contrast. Often a building that has been com- pletely camouflaged, and which otherwise could not be detected, is seen quite distinctly by the enormous contrast formed by itself and the shadow it casts. Many objects need only a suggestion of what they are to associate them with the actual object. This is true of objects with which we are familiar, for the mind, by the aid of memory and imagination, forms concepts as to the true shape and size of the object thus partially observed. Thus when a plane, even though the system of protective coloration is perfect, casts a shadow of itself on a bright sandy beach, the mind would immediately detect the plane by its association with its shadow. The modern schemes of camouflage take all these facts into consideration, and measures are taken to eliminate or to lessen the effect of these shadows as much as possible, adding in every case considerably less visibility to the plane.

The sensitive photographic plate was used to detect camou- flage in the World War with a great deal of success. Means of overcoming this detection have been studied by every unit of the army interested in camouflage. As the photo- graphic plates recorded different colours only in varying degrees of greys, all that is necessary to eliminate the camera as a camouflage detector is to use such a combination of colours so that equal proportions of the pigments which cause various shades of grey to appear on the plate are embodied in the camouflage. Then no matter what filter is used, the plate will always record the same grey or series

colour which fits the greatest number of these conditions. Low visibility in this case means that the enemy planes which fly high could not observe the low-flying planes, and therefore would be at a disadvantage. Also that planes so camouflaged would not be targets for bombs when preparing for formations in front of hangars. A great deal of work has been done on upper surface camouflage, both here and abroad, and much confusion has developed over its use or absence. The mean value of colour as scientifically measured over a large area of terrain when properly painted gives a dark greenish colour, somewhat darker and greener than ordinary khaki. Greenish yellow with a wave-length of about $.556 \mu$ is the most visible colour to the human eye. It can readily be seen if a plane is painted in khaki it would be far less visible than those done in clear dope and varnish, which is a yellow colour. Sufficient progress has been made in the manufacture of pigmented dopes which dry with dull matt surfaces to warrant their use as wing coverings. In this manner camouflage can be applied without additional weight, and with added protection to the fabric. Also by controlling the proportion of oil in the coating the light reflection factor can be increased or decreased at will. In any system of coloration the background against which the plane is silhouetted is a controlling factor of the colour and design used to obtain high or low visibility. It can readily be seen that there is greater contrast between a white object and a black screen than in a dull grey object and a similar screen. It is, therefore, obvious that a plane can be made more or less visible by a coat of paint. In order to obtain definite information upon which to base the correct or lowest visible colours or combination of colours, the best suited for camouflage of a plane in, that is to say, the tem- perate zone, a colour survey of the territory must be taken and the following factors measured: Hue, saturation and brightness. The mean of each of a series of these values must be then determined for the locality in which the plane will operate and a camouflage designed with that colour which when analysed more nearly matches the average of the above factors. So far the only measurements made from a plane at various altitudes have been in terms of white light. These

Curve plotted by Bureau of Standards which shows in terms of wave-length of light and amount of trans- mission the effect of visibility of various colours when seen by the human eye



measurements pave the way for further investigations in the matter of colour of the earth's surface when viewed from a plane at various altitudes and under different atmospheric environment.

Camouflage deduced from science not only deals with the factors of light, but with the physical act of translating this light into sensation or the action on the retina and with the psychological effect produced by this sensation through the mind. The human element, therefore, enters into this field of endeavour to a very large extent, and for this reason the curve reproduced herewith was plotted by the Bureau of Standards which shows in terms of wave-length of light and amount of transmission the effect of visibility of various colours when seen by the human eye. As this curve shows colours when seen by the human eye, it must be understood that this does not

of greys as is embodied in the general scheme of camouflage.

The logical conclusions on which to base the design of any camouflage system must be founded on the results obtained from the foregoing statements. With this in view, scale models of various planes were camouflaged and tested over miniature coloured maps and flying fields and in contrast with the sky. These models contain on the top an average of six different colours, varying from light tan to dark blue green. As was found by a partial colour survey with the eye, the earth colours were brownish yellow for wheat fields, green for grass, purple brown for wet freshly ploughed fields, light tan for dry earth and dark bluish green for wooded portions. With these colours placed on the upper surfaces of a plane, in proportion to the area, they appeared on the earth surface, certain of the colour patches on the plane were merging with similar colour on the earth surface, thus producing low visibility of the plane and also at the same time a distortion of its true shape and size. Further, the proportion of the colours were such that at a blending distance they formed a colour corresponding to that of the average earth colours after they were blended so that the plane thus coloured remained in a low visibility state at all times. The photograph of the camouflage model as illustrated in Fig. 1 shows this principle quite distinctly. The same illustration also shows models done in plain khaki colour, black and clear varnished dope surfaces. By holding the illustration a short distance from the eyes the camouflage plane will be seen to completely merge into background, while the varnished or white khaki and black, which is distinguished in the photograph by a thin white line on the trailing edge of the upper wing, stands out distinctly with a clear sharp defining silhouette. Sky camouflage for the under-surfaces of the wings of course has to be designed to meet the brightness

and colour of the sky; this was done by the use of pigments of a bright light reflecting power combined with a series of colour patches to give a sky colour. Fig. 2 illustrates this on a model in comparison with no camouflage. Fig. 3 shows a model in direct contrast with the sky. Fig. 4 illustrates the effect of insignia on the visibility of a plane; in the lower left-hand corner are models of the D.H. with a new insignia, that of three bands of colour, and one of the Spad with two circular insignias. Although both planes are low in visibility, due to their camouflage, it will be readily seen that the Spad with its two "bull's eyes" for insignia will present an enormous target to enemy planes. The psychological effects on the mind of two surfaces of colour as represented by the insignia of this Spad are to cause the mind to record not two separate spots, but to see only the area between them, thus unconsciously locating the heart of the plane and the pilot. The insignia should have a factor of visibility just above that of the plane in order that the first thing seen would be the mark that indicates the nationality of the machine. As all the Allies are using a circular form for marking their planes, it seems much more feasible and logical to change our insignia so that it would be distinct from those of other nations. We are now using in most cases two separate and distinct insignias, one a star in a circle and the other three bars or bands of colour as is found on the rudder of our planes. Not only does this tend to confuse the mind, but it destroys the low visibility factor of camouflage. The sensible thing to do is to use one standard marking for the entire plane. It should not be the concentric circle form, as that is already used by other nations. Three bands of colour as used on the rudder is the logical marking for the wings: is distinctive, simple, and can very easily be applied in production. Further, one insignia should be used on a wing surface instead of two as at present, for the reason stated before.

THE MACHINE TOOLS EXHIBITION

EVEN those who are acquainted with the work turned out by what are usually termed "machine-tools," will find much to wonder at in the great exhibition which occupies Olympia until September 25. It is unfortunately impossible in FLIGHT to review ever so briefly the displays on the 167 stands, but it may be said that the exhibition is an index to the tremendous strides which have been made since the previous—the first—exhibition was held eight years ago. It is within the recollection of FLIGHT readers that in the early days of the war it was discovered that machine-tools were needed in ever-increasing numbers to keep pace with the demand for munitions, and the industry in Great Britain, which up to then had not been on a very large scale, set to work in real earnest not only to speed up the supply of machine-tools of existing types, but also to produce new tools. The result is seen at Olympia, work now being carried out on

automatic machines to an extent undreamed of a few years ago, and many of the exhibits can be seen in motion, thus enabling their points to be studied to the best advantage.

The Exhibition was opened on Saturday, and on the previous evening a banquet was held in the Pillar Hall, Olympia, Sir Alfred Herbert, K.B.E., president of the Machine Tool Trades Association, being in the chair. The Chairman was supported by the Right Hon. Lord Amthill, G.C.S.I., and Sir Frederick W. Black, K.C.B., President of the Institution of Petroleum Technologists, and a number of distinguished guests and members of the Association. All the speakers expressed the opinion that if employer and employed would really get down to understanding one another, especially in the machine tool trades, British industries would still be able to maintain their world-supremacy unassailed.

Roll of Honour

It was announced by the War Office on August 28 that Sec. Lieut. G. H. Fletcher, W. York R. and R.F.C., who was previously reported missing, is now reported killed.

The Isle of Man and Service

THE Orders in Council extending the Military Service, Ministry of National Service, and Naval, Military and Air Force Service Acts to the Isle of Man have been revoked.

London Flying Club Changes its Name

IN deference to the consensus of opinion among the Members of the London Flying Club, the Committee has, after the fullest consideration, decided to acquiesce in the suggested change of title to the London Country Club, by which name the Club will be known in future. It is felt that the old name gives an erroneous impression that membership is confined to those directly connected with flying; whereas, although one of its objects is to encourage flying and aerial travel, it has been developed as a Social and Country Sports Club to which both ladies and gentlemen are eligible.

The Buc Meeting

ARRANGEMENTS have now been completed by the Aero Club of France for the meeting to be held on October 8, 9 and 10. On October 8 there will be a race over a circuit, taking in Chateaufort and Villacoublay, the owner of each machine competing to be either the pilot or a passenger. Attempts on the altitude record will be made on each of the three days. On October 9 the main event is a Concours d'address, in which two ballonets will be released at 30 second intervals, thirty seconds later the competitor will start, and the winner will be the competitor who destroys the

two ballonets and lands in the shortest time. On October 10 there will be a handicap for machines having a speed of at least 170 kilometres per hour, the handicap being framed on tests made by the Section Technique d'Aéronautique. On October 10 there will also be a competition for machines regularly employed on either the Paris-London or Paris-Brussels routes. Postal machines must carry a commercial load of 50 kilogs. and other machines must take two passengers on the outward journey although these may be replaced by ballast on the home journey. The trip from Buc to London or Brussels and back must be made in one day.

The entries include Bossoutrot, Pilon, d'Or, Rougerie on Farmans; Casale, Romanet, Bernard, Bizot and Bourdon on Blériot-Spads, Sadi-Lecointe and Kirch on Nieuports; Fronval, Maneyrol, Morane on Moranes; Douchy, Bajac, Deullin, Thierry, Breguet on Potez; and Bouyez on Hanriot.

The L 72 Renamed

THE French naval authorities have decided that the L72 recently delivered to France by Germany is to be known as the D.R.1, indicating that it is the first rigid dirigible belonging to the French Navy.

Brussels-Paris Fare Reduced

FROM September 4 the fares for flights between Paris and Brussels have been substantially reduced; they are now: Single journey 300 francs, return 450 francs, these charges including transport between the centre of the city and the aerodrome at each end.

Turin Bombarded by Leaflets

IN connection with the strike of metal workers in Italy, two aeroplanes flew over Turin on September 5 distributing propaganda leaflets, but they disappeared on the arrival of military aeroplanes.

AIRISMS

FROM THE FOUR WINDS

THE next Salon Aéronautique in Paris may possibly not be held even in 1921, but in the early months of 1922.

A THREE-DAYS' Air Congress in London sounds like getting a real move on towards letting all and sundry realise what is doing in the world of commercial aviation, with military and technical aspects as very substantial side-dishes. That it may materialise we fervently hope. That it *will* is pretty certain, as Mr. Winston Churchill has looked with encouraging interest upon the idea, and that means, in his dual ministerial capacity, half the battle.

THAT the War entirely revolutionised modern ideas of fighting is a matter beyond dispute, what with the work of the R.F.C. and of the Tanks. That the League of Nations can, it is equally certain, only impose its authority, if it is to

"PROPOSALS BY HAIR" was a headline in one of the dailies the other day which suggested some new aerial stunt, as recorded by a Cockney. But things are not quite as bad aerially as that. It is merely a recital of the funny little cooing ways, according to a returned American, sanctioned by custom in Japan, where he states, in this respect, it is an equivalent of Leap Year all the time. In our Ally's island home the women have certain ways of arranging their hair to indicate their feelings, and do not wear hats. Girls who would wed arrange the hair in front in the form of a fan or butterfly and adorn it with silver or coloured ornaments. Widows who are looking for second husbands fasten their hair at the back of the head by means of tortoiseshell pins.

Now, in "Urope," and possibly America, there is no necessity for all this specialising. Those who are "otherwise"



Aviation in China: The first Avro supplied to the Chinese Government by Messrs. Vickers, Ltd. In the front seat of the machine is Major C. Patteson, and in front are Chinese pupils forming the first flying instruction class at Nanyuan Aerodrome, Peking.

carry any weight whatsoever in this world's affairs, by being in the position to enforce compliance with its edicts. Therefore it is well that one reads of the great advances made in the mobility and general utility of these same Tanks and the growing importance which is attached to the possibilities of aircraft for "persuasive" purposes. As separate units each has its value, although when working in combination with other Army units as a whole, they become even more vital. Activities which are now contemplated, in place of the regular Army manœuvres, upon these lines for the purpose of testing the utility of the two new arms in conjunction with artillery and infantry should give valuable results. It may be that cavalry in these tests may well find its proper sphere.

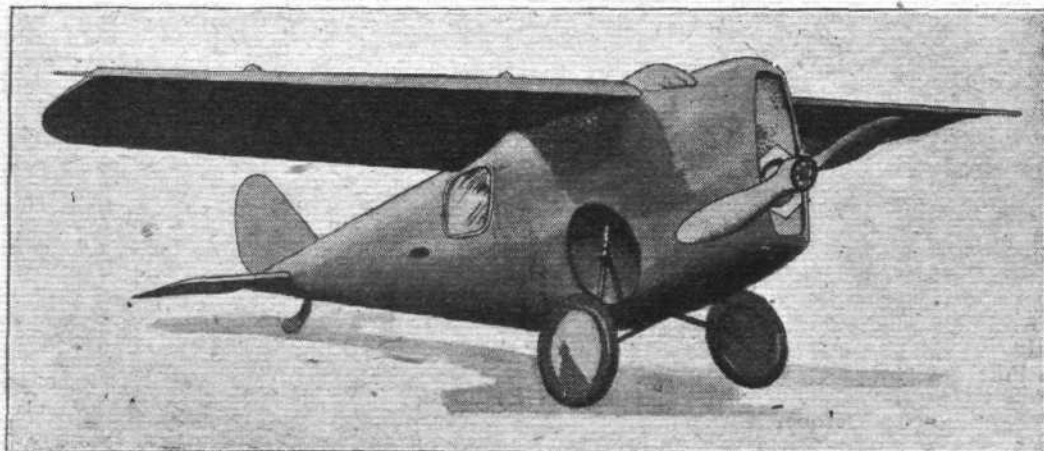
have an unmistakable "uniform" (with heelless boots). And they look it!

OUR American friend continues: "Widows who are resolved to remain faithful to their departed spouses cut their hair short and wear no ornaments in it."

Very rare specimens, these!

DURING the War Mr. Geoffrey Le M. Mandes was in the Royal Flying Corps. He is now utilising his skill then acquired, in his campaign as prospective Liberal candidate for North Hereford Division. This week he was responsible for a flying exhibition, a feature at Leominster Agricultural Show.

A Gordon-Bennett Entry from U.S.A. This sketch gives a general idea of the Dayton Wright machine. It is said to have a speed of 215 m.p.h. The undercarriage and wheels are drawn up within the fuselage when in flight. The planes are of the variable camber type.



FROM the *Morning Post*: "The sale of aeroplanes and equipment at Hardwick Aerodrome, Cambridge, suggests quite a lot. A two-seater Avro, ready to fly, was sold for £50, and another, 'A.D.26,' two-seater, which was damaged, went for 45s. It certainly looks as if inquiries ought to be made about licences for flying, and so on, when an aeroplane can be bought so cheaply. The writer remembers paying recently about 45s. for a long return taxi-cab ride! In future he will keep his eye open for aeroplane sales, and in the meanwhile learn to fly—perhaps."

THE annual dinner of the Optimists Club will take place at Frascati's on October 1. The club, which holds its meetings at the Oxford, has been better known latterly as the L.V.R. or London Volunteer Rifles, who rendered invaluable assistance to the London Fire Brigade during the air raids. They have now reverted to their original title. The corps was founded by Mr. Charles F. Higham, M.P., early in August, 1914, and was originally known as the Optimists National Corps. Mr. Higham, the president, will occupy the chair at the dinner, and will be supported by the vice-president, Mr. W. G. Coxen (Mayor of Holborn and late commanding officer of the regiment), Lord Dewar, and Sir Sampson Sladen (late chief of the London Fire Brigade, who was responsible for training some 500 members of the L.V.R.). Old members desiring to be present should communicate with the secretary, Mr. Carl Hentschel, the Optimists Club, the Oxford, W. 1.

WE only hope there is a fair amount of truth in the claim by Mr. J. Pannebakker, who is over here from Holland

with a new fuel which he states will give at least 50 per cent. better results than petrol. He declares that this motor fuel, which is composed of benzol with the addition of other chemicals, will give 38 per cent. greater mileage per gallon than petrol, and that the volume of benzol is increased by at least 10 or 12 per cent. Mr. Pannebakker has brought with him a quantity of the spirit, which he is prepared to hand over to representatives of the Government for trial and report. It is claimed for the new spirit that it could be used by a Handley Page aeroplane, and a special adjustment is being made to a Fokker aeroplane in order to experiment with it.

Some fuel, apparently.

THE demolition of the City churches has brought a windfall to a church at Poplar, which was bombed during the air raids, in the form of the pews of St. Mary's, Aldermay, which have been presented to the Poplar incumbent by the latter church, St. Mary's having acquired the ancient pews, etc., of St. Alphege Church, London Wall, one of the demolished City churches. It's an ill-wind, etc.

THERE is a pretty enterprising "artist" taking part in that master advertisement sand-picture stunt of the *D.M.* This smart youth, Desmond McKeown, at St. Andrews, managed to get his "exhibit" (66 ft. by 45 ft.) on the sea-shore photographed from an aeroplane and sent his evidence up to our contemporary with the note, "When you send me the £50, please send it in a postal order"! That boy, *what*, 10, should get on.

THE ROYAL AIR FORCE

London Gazette, August 31.

Permanent Commissions

Flying Officer C. S. Miller (O.) resigns his permanent commn., and is permitted to retain his rank; Sept. 1.

Short Service Commissions

Flying Officer A. F. Alexander (A.) resigns his short service commn., and is permitted to retain his rank; Sept. 1.

Flying Branch

The following *Sec. Lieuts.* to be *Lieuts.*—J. H. Preston; Feb. 1, 1919 (since demobilised); L. C. Taylor; March 27, 1919 (since demobilised); A. G. Thistle; June 5, 1919 (since demobilised).

Lieut. (Hon. Capt.) V. M. Montague-Smith relinquishes his temp. R.A.F. commn. on appointment to a commn. in the T.F.; July 26 (*Gazette* of March 19 to stand).

Lieut. A. C. Sharman relinquishes his temp. R.A.F. commn. on transfer to T.F. Reserve (*Gazette* of March 7, 1919, to stand).

The following are transferred to *Unemployed List*:—Sec. Lieut. L. A. Lewinton; Jan. 28, 1919. Lieut. R. O. Goddard; Feb. 7, 1919. Lieut. S. E. Backus; Feb. 15, 1919. Sec. Lieut. A. H. Thomas; March 11, 1919. Lieut. D. B. G. Francis; April 2, 1919. Lieut. (Hon. Capt.) J. E. Johnston; April 30, 1919. Sec. Lieut. F. Dorsey; Aug. 12. Lieut. J. Kirk, M.C.; Aug. 13.

Flight Lieut. A. Frauenfelder relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain his rank; Sept. 25, 1919.

Lieut. T. E. McMann is dismissed the service by sentence of a General Court-Martial; Aug. 6.

Administrative Branch

The following are transferred to *Unemployed List*:—Lieut. (Hon. Capt.) A. W. Jones; Feb. 6, 1919. Sec. Lieut. H. Preston; April 22, 1919. Lieut. P. Harvey; Jan. 31. Lieut. L. P. St. V. Nepean; April 12 (substituted for *Gazette*, April 20).

Lieut. (Hon. Capt.) C. H. M. Willson (L'pool R.) relinquishes his temp. R.A.F. commn., and is permitted to retain the rank of Capt.; Jan. 15, 1919 (*Gazette* of Feb. 25, 1919, to stand).

Sec. Lieut. (Actg. Lieut.) (Hon. Capt.) G. H. Green relinquishes his R.A.F. commn. (*Gazette* of April 8, 1919, to stand).

The notification in *Gazette* of July 13 concerning Lieut. (Hon. Capt.) C. M. H. Willson is cancelled.

Technical Branch

Sec. Lieut. T. E. Pennington to be Lieut., without pay and allowances of that rank; April 2, 1918 (since demobilised).

The following *Pilot Officers* to be *Flying Officers (Grade A)*: E. J. Tibbatts; Aug. 6, 1919 (since demobilised). G. Hill; Oct. 6, 1919 (since demobilised).

The following are transferred to *Unemployed List*:—Lieut. F. Adams; Nov. 16, 1919. Lieut. T. Lund; Aug. 14. Lieut. L. J. Stuart; Aug. 22. Lieut. (Act. Capt.) F. A. Mawdsley relinquishes his R.A.F. commn. (*Gazette* of Feb. 4, 1919, to stand).

Medical Branch

The following are transferred to *Unemployed List*:—Capt. M. C. Breese; June 12 (substituted for *Gazette* of July 2). Capt. D. Cromie, M.B.; Aug. 4.

Memoranda

Wing Comdr. R. A. Bradley, C.M.G. (late Maj., N. Staffs R.), having retired from the Army and relinquished his R.A.F. commn., retains the rank of Lieut.-Col.

(Then follow the names of 12 Overseas Cadets granted temp. commns. as Sec. Lieuts. and 89 Cadets granted hon. commns. as Sec. Lieuts.)

London Gazette, Sept. 3.

Short Service Commissions

The Notifications in *Gazettes* of Dec. 5, 1919, and Feb. 17, 1920, appointing Flying Officer H. C. Price (A.) to a short service commn. are cancelled.

Flying Branch

The following are placed on *Half Pay List (Scale B)*:—Flight-Lieut. J. A. Barron; July 27. Flight-Lieut. G. B. Aufrere Baker; Aug. 20. Flying Officer B. V. S. Smith, M.C., A.F.C.; May 1.

Lieut. E. D. G. Galley, M.C., A.F.C. (Lieut., R.A.S.C.), relinquishes his temp. R.A.F. commn. on return to Army duty; Aug. 19.

The following relinquish their commns. on appointment to T.F.:—Lieut. S. J. Hawthorn (notification in *Gazette* of Feb. 25, 1919, to stand). Sec. Lieut. T. G. L. Harris; July 25 (notification in *Gazette* of March 18, 1919, to stand). Sec. Lieut. W. V. Pearce (notification in *Gazette* of June 10, 1919, to stand).

The following are transf'd. to *Unemployed List*:—Sec. Lieut. G. W. H. Vint; Jan. 14, 1919. Sec. Lieut. T. C. Beeken; Jan. 17, 1919. Sec. Lieut. (Hon. Lieut.) H. E. Davis, M.C.; Feb. 25, 1919. Sec. Lieut. F. W. Davis; March 5, 1919. Lieut. W. S. Robinson; April 13, 1919. Lieut. R. J. Ashmore; July 3.

Lieut. D. King relinquishes his commn. on account of ill-health caused by wounds, and is permitted to retain his rank; Aug. 28.

Administrative Branch

The following are transf'd. to *Unemployed List*:—Sec. Lieut. (Hon. Lieut.) A. T. Hughes, M.B.E.; Aug. 11. Lieut. H. C. Bird; Aug. 13.

Lieut. (Hon. Capt.) J. R. Ramsay relinquishes his commn. on account of ill-health contracted on active service; Aug. 26.

Sec. Lieut. L. E. Walsley relinquishes his commn. on account of ill-health, and is permitted to retain his rank; May 22, 1919 (substituted for notification in *Gazette* of June 3, 1919).

The surname of V. B. Ranford is as now described, and not Randford as stated in *Gazette* of June 6, 1919.

Technical Branch

Flying Officer L. H. Hillier is rest'd. to Active List; April 12.

Flying Officer F. Susans, M.B.E., is placed on Retired List and is granted rank of Maj.; Sept. 4.

The following are transferred to *Unemployed List*:—Lieut. E. C. Day; Jan. 9, 1919. Lieut. H. G. P. Browne; Aug. 1.

Medical Branch

The following are transf'd. to *Unemployed List*:—Lieut. R. I. Rhys; Aug. 8. Capt. (actg. Lieut.-Col.) A. P. Bowdler, O.B.E., M.A., M.B.; Aug. 14.

Memoranda

P.F.O. A. C. Baker is granted an hon. commn. as Sec. Lieut.; March 26, 1919.

The notification in *Gazette* of July 27 concerning Wing Comdr. J. W. O. Dalglish, O.B.E., is cancelled.



The "R.80"

In connection with the description of the Vickers rigid dirigible, "R.80," published in our issue of August 26, it should be noted that the drawings were reproduced by us on a smaller scale than that to which they originally appeared in *Engineering*.

The Next Paris Salon

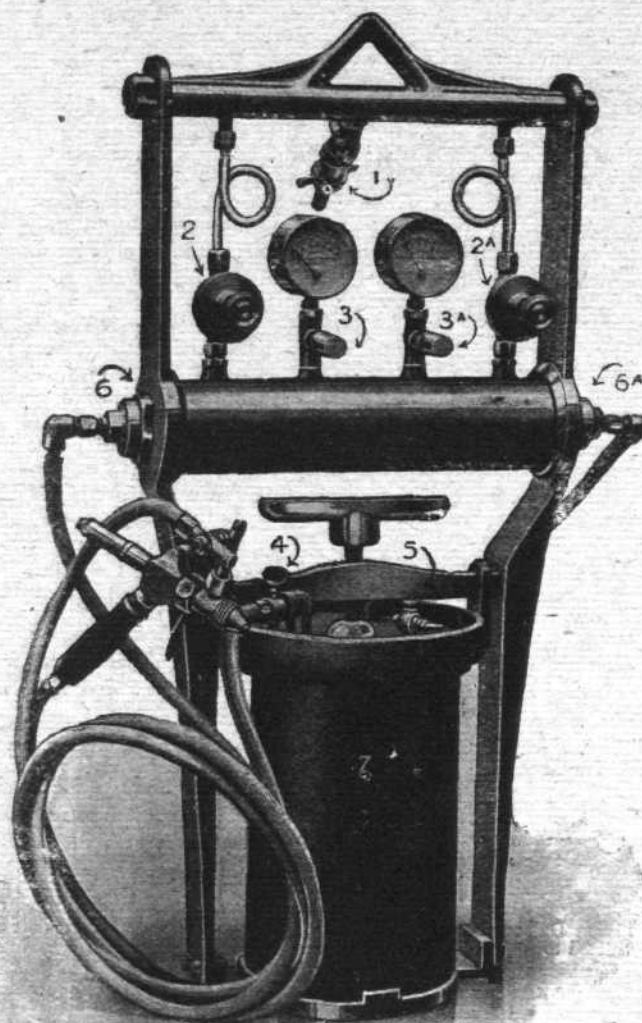
It has now been officially announced that in accordance with the wishes of the French manufacturers, who will not have new models ready in time, there will be no Salon de l'Aeronautique in the Grand Palais this year. The next Salon will be held either towards the end of 1921 or at the beginning of 1922.

SPRAY PAINTING

THERE are few branches of any industry where labour-saving methods cannot be employed in one way or another, and whatever the work in hand, every process or stage should be examined with a view to introducing such methods wherever possible. It is remarkable how many opportunities are overlooked in this respect, as, for example, various kinds of paint work—i.e., the application of protective materials to wood, metal, cement work, etc. No doubt the latter is considered by some to be such a simple process in itself as to be not of sufficient importance to warrant the introduction of labour-saving methods. As a matter of fact, paintwork is not such a simple matter as one would at first suppose—a slight suspicion of which was manifest when the writer undertook to paint the common-or-garden domestic bath! We were, however, considerably surprised, when visiting the works of the Air Brush Manufacturing Co., Ltd., of Arlington Street, London, E.C. 1, who are specialists in spray painting, to discover that painting is a science in itself, with a hundred and one items on which the success or failure of a job depends. It is in the consideration of and attention to these items where the Air Brush Co. makes good, for the scientific theory of painting and all appertaining thereto has been investigated thoroughly in the course of developing the various instruments and plants turned out by this firm. It is not a bit of good introducing labour-saving methods unless they do their job practically and efficiently, as well as save labour; far better employ the ordinary methods, and do the work thoroughly.

Practically all classes of painting and decorating may be done by spraying, from fine line black and white or water-colour drawings to large heavy work using enamels or thick varnishes. Aeroplane fabric can also be doped by this process. The Air Brush Manufacturing Co. supply a large variety of instruments and accessories, covering all these classes of work. In each case the general principle is the same—air is compressed into a tank, from which it is led through suitable piping to a pressure-regulating valve, and thence to the air "brush." On the operation of a trigger, the air finally issues from the nozzle of the brush, drawing with it the paint in the form of a fine spray. The paint is fed to the brush by gravity from a container either mounted on the brush itself or from a larger container mounted conveniently near-by, and connected to the brush by a length of flexible tubing. The paint may also be pressure-fed, in which case a supply of compressed air is led, through a regulating-valve, into an air-tight paint-container, the paint being forced out at the base *via* a pressure regulator, and led to the brush through flexible tubing.

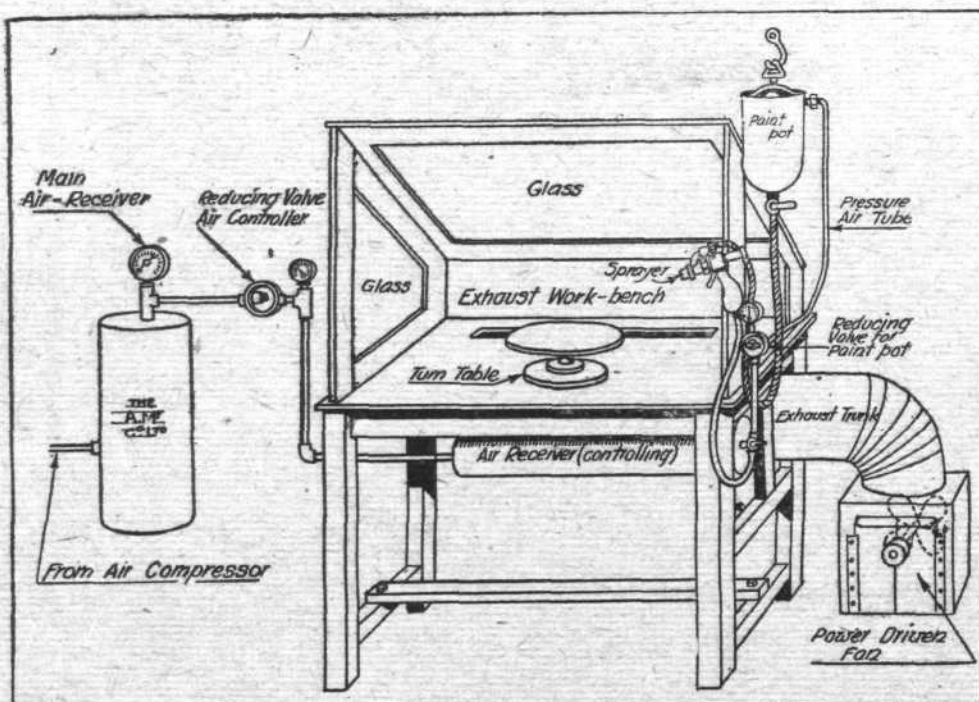
As previously stated, there are several models of these spraying plants to suit various kinds of work, but space will not permit a description of these. We give, however, illustrations of one of the "Nimbus" air brushes, a handy portable plant, and a diagram showing the general lay-out of a complete "Nimbus" spraying installation.



The "Nimbus" Portable Combination Painting outfit. Compressed air from the compressor enters at (1), and passes through a clarifier (6), *via* a pressure regulating valve (2), to the "Air-Brush." Air is also similarly led *via* (2A) and (6A), to the paint container (7), thus forcing the paint through the connection (4) to the "Brush." (3) and (3A) are safety valves, and (5) is a release cock for the paint container

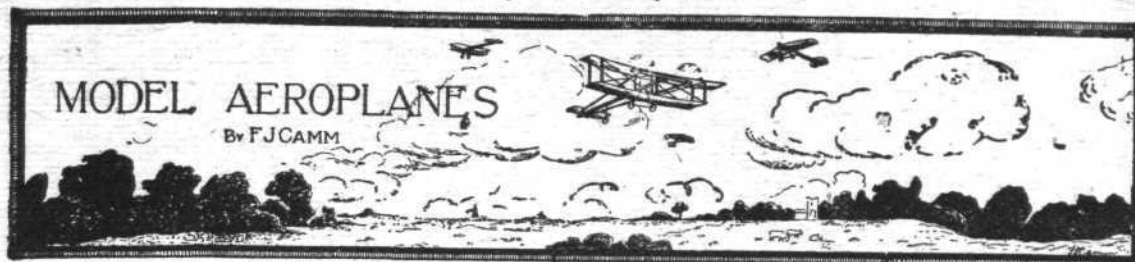


The "Nimbus" Paint Spraying Pistol, or "Air-Brush," and on the right diagram showing the lay-out of a complete "Nimbus" Paint Spraying installation



In all these plants special attention has been paid to the ventilation of the work-benches or painting-compartments—a most important matter in connection with high-class paint-work or doping. In one form fumes, dust, etc., are drawn from the bench or cabinets, through a vent in the latter, by means of a suitably-driven exhaust fan; but the latest form—the invention of Mr. A. Attwood—known as the hydro-exhaust, is a considerable improvement on previous methods.

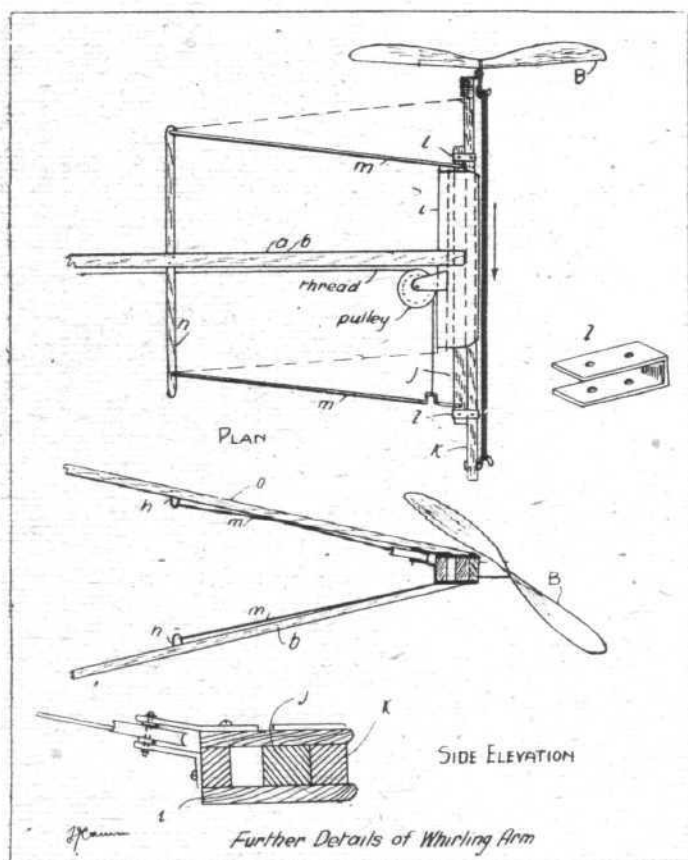
Briefly, it consists of a cabinet containing a series of plates over which flows a film of water. The fumes, dust or other matter are drawn into the apparatus by means of a fan, and are deposited on the plates and carried off by the water which is collected in a trough and led to a tank. This apparatus can be made in various forms to suit different conditions, either as a permanent fixture or portable.



All communications to be addressed to the Model Editor. A stamp should be enclosed for a postal reply

A Whirling Arm—(Continued)

ONLY two parts of the apparatus remain to be given in detail, the portion which travels transversely across the end of the arm under the thrust of the screw, and the pan carrying the variable weights for measuring the thrust. In the drawing *ab* are the upper and lower spars previously shown; *hh* are short crossbars about 12 in. length; *mm* are



four stout wire radial arms; *j* is a hard wood bar 14 ins. long, to which the wire arms are attached by means of round-headed screws. Eyes are formed in the ends of the wire, and in these the screws should make a running fit with sufficient play to allow the arms to turn about them easily; *i* is a deep channel secured to the spars *ab*, the spars being bevelled at their ends to fit respectively on the upper and lower sides of the channel. In this channel the bar *j* is to slide.

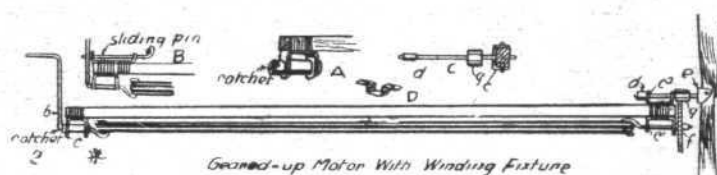
On the side of the channel nearest to the centre of rotation is mounted a pulley in the manner shown in the small detail drawing. This pulley is to take the thread which is fastened off on one of the wire arms and which, passing over the pulley, runs up alongside the spar *a*, and then divides to pass over the two pulleys on the upper ball bearing, then down again to the weight pan. The full range of movement of the bar *j* in the channel need not be more than 2 or 3 ins., the amount of such movement being indicated in the drawing by the angle of the wires shown dotted. The wire arms are shown in the position they would assume when the screw is thrusting, and the thread being under tension is

raising the weight. The arrow indicates the direction of motion under thrust. It now remains to provide means for attaching and detaching the motors and screws it is desired to test. This is done by means of two small U-shaped plates *l*. These are bent so that they fit the motor spar *k* and the bar *j*, and by means of two movable pins dropping through holes in the plates and bars *j* and *k* lock them securely together. Thus any motor and any screw can speedily be put on or taken off. The channel *i* is shown deep enough to embrace the motor spar *k*, and a few motor spars of different lengths but of the same cross-section should be made and considered part of the apparatus. When it becomes necessary to test the rubber and screw of a model, the rubber is detached from the model and put on the motor spar which fits it as regards length.

(To be Continued)

A Self-contained Geared Motor

I SHOW herewith drawings of a self-contained geared motor—self-contained in so far as it carries with it a light winding apparatus. Such a motor is a decided acquisition with some models. At one end a double bearing of brass is to



be provided for the winding crank. Two methods are shown of checking the handle from "returning" or flying back after the turns have been applied. One is by means of a ratchet formed on the end of a short piece of brass tube, and shown in detail at *A*. The alternative method is to dispense with the ratchet and fit a sliding pin which, by being slipped forward beyond the arm of the handle after winding, engages with the handle and prevents it from turning. This arrangement is shown by *B*. Of the two the tube ratchet is most convenient, but the sliding wire most effective, especially if a notch is filed in the wire for the handle to drop into and so prevent the wire slipping back.

If the ratchet is decided on, the lugs turned down on the plate forming the double bearing *C* must be large enough to take the tube. The ratchet should be cut in the tube to the shape shown at *a*. If the sliding-wire bar is used, another double bearing must be provided for it above the motor spar, as shown by *b*. At the other end of the motor spar two more double bearings are required, *c*¹ and *c*², *c*¹ being for the main rubber spindle carrying the gear wheel *f*, and *c*² for the propeller spindle. Both the wheel *f* and the pinion *g* can be obtained from the movement of an old clock; *f* has 40 teeth and *g* about 12 teeth. The motor, if such a ratio is employed, would be geared up 1 to 3½. Having drilled the bearings to the centre distances of the two gears correctly meshed, slip the wheel and spindle *F* into place and bend the hook to receive the rubber. The other spindle is to have a piece of plate *e* bent to the shape shown at *c* and drilled on each side for pins. This is to engage with the propeller, to which it is fastened by pins. The spindle should also be put in place and a collar *d* soldered.

Reply to Correspondent

F. B. C. S. (H.M.S. Carnarvon).—Many thanks for the detail drawing, which I shall deal with in due course.

SIDEWINDS

THERE is significance in the fact that French cars in the great American race had to come to England for their plugs. The three Ballot cars, which in the hands of Rene Thomas, De Palma and Chassagne finished second, fifth and seventh respectively, were fitted with K.L.G. plugs, a fact which the sole distributors, Messrs. S. Smith & Sons (M.A.), Ltd., are very proud.

ALSO at the recent Essex Motor Club members meeting at Brooklands, K.L.G. plugs were fitted to all the winning cars. In five races, five firsts, five seconds and five thirds were secured by cars fitted with K.L.G. plugs.

THE AEROLITE PISTON CO., LTD., give notice that they have acquired more commodious premises, and on and after Monday, September 6, their address will be 36, North Audley Street, Oxford Street, W.1.

It has come to the notice of Messrs. S. Smith & Sons (M.A.), Ltd., that K.L.G. aero plugs purchased from the Government, are being offered for sale for use on motor cars, and they ask us to announce that K.L.G. aero plugs are totally unsuitable for any but aero engines, for which they were specially designed, and they cannot hold themselves responsible for plugs sold by anyone but themselves or by their own agents.

SHIPPING agents have to be constantly in touch with owners, and in many instances full details of cargoes being shipped in their vessels from the port of London have to be sent by telegram. In the course of a recent interview Mr. E. P. Leigh Bennett, the Secretary of the British Amsterdam Maritime Agency, Ltd., the London agents of the Holland Steamship Company of Amsterdam, was understood to say that the cost of telegrams averaged £84 a year. They now find it more convenient to make use of the Handley Page Royal Air Mail Service to Amsterdam and are saving at the rate of £60 per annum, besides frequently obtaining prompt replies to important communications without being compelled to go to the cost of telegrams.

WE hear from Messrs. Aerofilms of the London Aerodrome, Hendon, that H.R.H. The Duke of York, has accepted an aerial photographic enlargement taken by that firm of Windsor Castle. The letter from H.R.H.'s Equerry states: "His Royal Highness considers it a most excellent piece of work and greatly appreciates your kindness in having presented it to him."

Revolvers by Aeroplane

AT Marlborough-street Police Court on August 31 Humphrey Wright, 34, a labourer, was charged with having in his possession at the London Terminal Aerodrome, Croydon, nine revolvers, the property of Gretchen Menken, an American citizen, without permission from the competent authorities. Mrs. Gretchen Menken, aged 38, staying at the Ritz Hotel, was charged with bringing the revolvers into this country without permission.

It was stated that on the evening of August 25, Mrs. Menken arrived with her son, aged 14, at the Croydon Aerodrome from Paris, and that the nine revolvers were taken from the aeroplane by Wright and conveyed in a motor-car to the Ritz Hotel. Mrs. Menken said that her son had a hobby for collecting revolvers, and that he had brought them from the Continent. It was not suggested that there was any improper motive.

Mr. Mead bound over Wright in £5 to come up for judgment if called upon. Mrs. Menken was ordered to pay a fine of £50.

PUBLICATIONS RECEIVED

Report No. 87. *Effects of Nature of Cooling Surface on Radiator Performance*. National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

Technical Note No. 11. *The Problem of the Turbo-Compressor*. By René Devillers. National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

Report No. 68. *The Effect of Kiln Drying on the Strength of Airplane Woods*. National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

Catalogue

Apex British Made Tools. Ira Miller and Co., Ltd., 92-94, Paul Street, Finsbury, E.C.2.

Artists Wanted

ARTISTS used to rapid freehand sketching of a car, chassis and mechanical details are required for several weeks' work in connection with the forthcoming Olympia Motor Show. Applicants should apply to the Editor of the *Auto*, 36, Great Queen Street, Kingsway, W.C.2.

To Our Readers

As we continually receive complaints from readers that they experience difficulty in obtaining their copy of *FLIGHT* promptly each week, we draw their attention to the subscription form which is printed on page xviii of the current issue. If this is sent, accompanied by the appropriate remittance, to the publishing offices, 36, Great Queen Street, W.C., it will ensure *FLIGHT* being received regularly each week upon the day of publication.

NEW COMPANIES REGISTERED

DUTTON MANUFACTURING CO., LTD.—Capital £5,000 in £1 shares. Acquiring rights in the Repault Compression Tap and the Petrol Tap Engineers, manufacturers of aircraft and automobiles, etc. First Directors: H. J. Ratcliffe, O.B.E., W. Yates, A. H. Dutton. Solicitor: F. J. Reynolds, 12, Queen Street, E.C.

FLYING AERO-MODEL CO., LTD.—Capital £2,500 in £1 shares (1,500, pref.). Acquiring business of scientific aero-model manufacturers, dealers and retailers as formerly carried on by C. J. Yuske. Permanent directors:—C. J. Yuske, V. V. Dibousky, W. H. Appleton and N. Wiren. Solicitor, C. L. Baddeley, 77, Leadenhall Street, E.C.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations:—cyl. = cylinder; I.C. = internal combustion; m. = motors. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1919

Published September 9, 1920

- 6,206. BIJUR MOTOR APPLIANCE Co. Starting apparatus for aircraft engines. (124,723.)
- 6221. A. H. R. FEDDEN, L. F. G. BUTLER and COSMOS ENGINEERING Co. Balancing of engines. (149,380.)
- 9,301. H. SCOTT-PAINE and SUPERMARINE AVIATION WORKS. Controlling means for aircraft. (149,389.)
- 9,307. H. SCOTT-PAINE and SUPERMARINE AVIATION WORKS. Bodies of flying boats. (149,390.)
- 11,816. G. I. TAYLOR. Parachutes. (149,418.)
- 11,998. R. M. RICHARDSON. Tension device for brace members of aircraft. (149,432.)
- 12,996. NORTH BRITISH RUBBER Co. and H. LORD. Means for directing aircraft during fog, etc. (149,460.)
- 14,096. P. CLERGET and CLERGET, BLIN ET CIE. Roller bearings. (149,480.)
- 16,637. J. H. FORBES. Distance recorders. (149,501.)

APPLIED FOR IN 1920

Published September 9, 1920

- 10,370. M. B. RUSSELL. Rotary I.C. engines. (149,600.)

If you require anything pertaining to aviation, study "FLIGHT'S" Buyers' Guide and Trade Directory, which appears in our advertisement pages each week (see pages xx, xxi and xxii).

NOTICE TO ADVERTISERS

All Advertisement Copy and Blocks must be delivered at the Offices of "FLIGHT," 36, Great Queen Street, Kingsway, W.C. 2, not later than 12 o'clock on Saturday in each week for the following week's issue.

FLIGHT

The Aircraft Engineer and Airships

36, GREAT QUEEN STREET, KINGSWAY, W.C. 2.

Telegraphic address: Truditur, Westcent, London.

Telephone: Gerrard 1828.

SUBSCRIPTION RATES

"FLIGHT" will be forwarded, post free, at the following rates:—

| UNITED KINGDOM | | | ABROAD* | | |
|-----------------------|----|----|-----------------------|----|----|
| | s. | d. | | s. | d. |
| 3 Months, Post Free.. | 7 | 7 | 3 Months, Post Free.. | 8 | 3 |
| 6 " " " " " " | 15 | 2 | 6 " " " " " " | 16 | 6 |
| 12 " " " " " " | 30 | 4 | 12 " " " " " " | 33 | 0 |

These rates are subject to any alteration found necessary under abnormal conditions and to increases in postage rates.

* European subscriptions must be remitted in British currency.

Cheques and Post Office Orders should be made payable to the Proprietors of "FLIGHT," 36, Great Queen Street, Kingsway, W.C. 2, and crossed London County and Westminster Bank, otherwise no responsibility will be accepted.

Should any difficulty be experienced in procuring "FLIGHT" from local newsvendors, intending readers can obtain each issue direct from the Publishing Office, by forwarding remittance as above.